

BRASS WORLD

AND

PLATING — POLISHING — FINISHING

A Monthly Publication Relating to the Arts of Refining, Alloying, Casting, Rolling, Plating, Polishing and Finishing of the Non-Ferrous Metals and Their Alloys

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Under Coats and Striking Coats in Plating

Preliminary Deposits Before Final Plating and Finishing

By ELECTROGRAPHER

WRITTEN ESPECIALLY FOR THE BRASS WORLD

THE difference between under coats and striking coats in plating may best be explained by classing the former as those deposits of metals of a different kind from the finishing surface and the latter as preliminary films of the same metal as that to be finally superimposed. At the present time much more use is made of both than was formerly the case. There are advantages in the use of each and in some cases they are a necessity. Many experienced electroplaters, however, consider it doubtful whether they are needed so much as some people suppose.

The origin of this present writing was generated in the mind of the writer when, in the warehouse of one of the largest producers of plating outfits and accessories, the manager stated that a number of nickel platers used a deposit of copper as an undercoat and the many outfits they provided for the purpose. No doubt this custom—for it can be called nothing else—arose at the time of the bicycle boom many years ago, when riders demanded something more resistant to rust than the none-too-generous deposit of nickel usually given. Not that the undercoat of copper will ward off the inevitable rust of neglect indefinitely—especially if not burnished before the nickel follows—but it helped to delay it and so that was a point gained. Then, again, the nickel strikes more easily on the copper owing to the higher conductivity of the latter, and some people aver that the color of the final deposit is better, but that is a debatable assertion.

The quality of finishing color does not depend on a preliminary deposit of a metal of a quite different tint. Several things influence the color of a nickel deposit and whiteness, especially of a thin coating, is scarcely assisted by the redness of one underneath. Nor is a coating of copper needed to obtain adhesion of the nickel. For years the writer nickel-plated thousands of machine parts every month—some of which are probably in use in various parts of the United States to this day, for they were made to endure—but there is no copper underneath. A good

thick deposit of nickel of a color many present day platers seem to have forgotten how to produce, firmly adherent and hard wearing was given to each, nor was there any trouble in giving it. The only flaking ever seen was on those rare occasions in the summer when the shop became too warm and the current consequently had easier work, or it had not been adjusted to a lighter load. But even this rare flaking only cheered us by the assurance of the undoubted thickness of the deposit.

The value of an undercoating of metal—where such is necessary—of a color approximately more nearly to that of the final deposit is seen in the preference many chromium platers have for nickel as a base rather than one of copper. In nearly all cases the chromium deposit is merely a film and the whiteness of the undercoat is a matter of some importance. The reason for the use of copper at all in this process is of course the ease of deposit and the assurance of adherence. The cause of most flaking of nickel undercoats on steel or iron can be put down generally to the craze for speed. Providing the surface of the ferrous metal has been properly prepared the slower deposit of nickel is usually the most firmly adherent.

The freely circulated complaints of flaking of nickel deposit upon bare steel and iron so frequently heard today are not easy to understand by experienced nickel-platers, apart from the universal craze for speeding up. A coating of nickel deposited too rapidly will always flake and peel in a chromium bath. The sudden influx of very dense currents is too much for anything but the most adherent deposit. Hence it may be a good thing in preparing for chromium deposits in this way to hasten slowly. Speed can be bought at too high a price, as we are daily being reminded on the roads. Undoubtedly nickel bases for chromium have more to recommend them than those of copper or brass, but the greater speed with which these can be deposited safely has attractions in the eyes of many platers.

The comparative ease of depositing cadmium and its

affinity for iron suggests an alternate base for the plating of chromium. The whiteness of this metal is more suitable than the more yellow tone of nickel, and the high polish that it is capable of should add to its suitability. Its vulnerability to attacks from acids suggests its only bar in a chromium solution, but if at once struck immediately on its introduction to the bath, this difficulty may be overcome. That means the current must not be switched off but the bath filled as other goods are taken out, or when necessary, some anodes should be temporarily transferred to the cathode bars. When aluminum deposition becomes a more practical proposition, we may find here the ideal undercoat for a deposit of chromium, but until then we must do the best we can to find perfection.

Striking coats are strictly those deposits of metal which are to form a base for the same material in greater thickness and obviously are confined to those with which this can be done without undesirable results. Gold and silver are the metals for which separate striking solutions are most often used. The "quicking" process for silver is really an undercoat of another metal and is familiar to all platers. The well-known brightening bath is a good example of a finishing solution that partakes of none of the characteristics of those required for either undercoats or striking coats; it deposits purely a finishing coat of the same metal. The striking solution for silver is a necessity in the case of some metals to be plated, as in that of pewter or alloys in which lead forms the chief constituent. The alternative—much used formerly—was the use of an undercoat of copper when such metals had to be silvered.

Gilding is another process for which striking coats are used, and in this instance the value of the metal has something to do with the necessity. Just as solid gold goods of inferior quality are "colored," so when thick deposits

are necessary the striking coat is often of lower grade. The use of copper anodes will prevent the purity of deposit that may be too expensive for the job in hand. In fact the provision of such valuable anodes as gold is one of the reasons for a preliminary striking bath where they are not a necessity. However, so many attendant circumstances govern the production of a pleasing deposit of gold that quite a good color can be obtained from a poor old bath if heated sufficiently or enough current is used while a cold but richer solution would perhaps not do so well with a lower density. Gilding is not difficult work, but it is decidedly tricky and exacting at times.

Although commonly classed as striking coats, those deposits which are obtained by higher voltage preparatory to being followed by heavier ones at a slower pace, can scarcely be considered so logically. In these cases the coating is one and continuous as in that of nickeling die castings. When it is remembered that these goods contain, in some instances, over 75 per cent of zinc, and the behavior of this metal in the bath under ordinary circumstances is borne in mind, the need for striking immediately with a high voltage is at once apparent, but this cannot be considered a "striking coat."

In regard to die castings similar practice obtains amongst chromium platers, although many prefer a copper base on these. The writer was shown some cycle hubs made in this way recently. They were composed largely of zinc and were chromium plated direct on the alloy. Struck by a high voltage, they were finished fairly bright by a lower one, and then improved by a slight buffing. The coating was firmly adherent and appeared to be of suitable thickness. Nickel is certainly feeling the competition of the newer process and it is up to the platers to improve the color of their nickeling, which has not received all the attention it should to preserve the standing of their business.

Statuary Bronze Finish

To the Editor of BRASS WORLD:

I notice in your July issue a solution for a statuary bronze finish. I would like to inform you that I have gotten good results with this solution:

Water	1 gal.
Sulphate of ammonia	1 oz.
Sulphide of Barium	1 to 1½ ozs.

This dip should be used cold, and brass, either casting or plated, should be plated in a copper strike solution previous to dipping in the oxidize. It is well to use a good grade of lacquer after oxidizing to protect the finish.

I also notice your solution on cadmium. I have had fair results with this solution:

Water	1 gal.
Cadmium oxide	3 ozs.
Sodium cyanide	7 ozs.
High broken test potash.....	2 to 4 ozs.

A good white deposit can be produced by addition of 1 to 2 ozs. cyanide of mercury to this cadmium solution. This can be used for imitation antique silver, etc.

I have had quite fair results with this chromium solution:

Chromic acid	40 to 60 ozs.
Chromate of iron	1 to 2 ozs.
Water	1 gal.

I use an iron tank and lead anodes.

Coldwater, Mich.,
August 1, 1929.

ANDREW V. RE.

Easy-Reading Mercury Thermometer

A new type of thermometer which is filled with mercury in manner similar to the generally used type but which has a red reading column making it simpler to note the readings, has been developed and placed on the market by the A. E. Moeller Company, Brooklyn, N. Y. The thermometer is made possible by a new invention called "Moeller Glass," it is stated.

These thermometers have a red glass column and to read the temperature it is necessary only to note the bottom of the red column, which is the top of the mercury column. The mercury acts as in other thermometers, rising with the temperature, but as it rises it makes the red reading column shorter. The makers state that the "Moeller Glass" is made in a manner which causes the red glass column to stand out clearly, making it distinctly readable from angles at which readings in ordinary thermometers are difficult due to light reflections.

Aluminum Refining Process

A process for refining aluminum in a manner which insures complete uniformity of mixture and other desirable properties, has been developed by the National Bronze and Aluminum Foundry Company, Cleveland, Ohio, it is announced.

The company states that a furnace has been developed for melting the raw material and the alloying agents, while eliminating oxides and other impurities all in one operation. The company markets the metal thus produced under the name "Tenual."

Cadmium on Bearing Surface

Q.—Have you available any information regarding the action of cadmium plate in bearing surfaces? Any such data you may have available, or your suggestions as to where it might be obtained, would be very greatly appreciated.

We have in mind using cadmium plate on certain steel parts used in counter instruments to prevent corrosion. Some of these parts are subject to wear both as bearing journals and in positions where the motion is one of translation.

We are wondering if cadmium in these places will prove detrimental, bug, or bawl up, cause scoring and excessive wear.

A.—Cadmium plate is one of the best coatings available for the protection of steel against rust but it is soft and does not wear well on a bearing or sliding surface. If the nature of the instrument is such that the wearing friction is rather slight and infrequent, cadmium should serve very well. If the friction is relatively severe and continuous it would be better to use chromium plate (say 0.0005 inch thick) on a base plate of about 0.0002 inch nickel or cadmium. The chromium imparts the necessary hardness and presents a good bearing surface, while the base coating protects the steel against corrosion. A somewhat thinner chromium plate might be used if the service is not too severe, but too thin a coating of chromium in proportion to the service expected from it is of little value.

—H. M. ST. JOHN.

Dissolving Gold for Plating Bath

To the Editor of BRASS WORLD:

On page 174 of your July issue a question and answer was printed on "Dissolving Gold for Plating Bath." While the answer was quite correct, a simpler and faster method is as follows:

Dissolve gold in 3 ozs. muriatic and 1 oz. nitric acid (8 ozs. will dissolve 1 oz. of gold). When gold is all dissolved, pour mixture into a mixing bowl of 1 gal. size, add water 1 qt. and ammonia a little at a time, stirring all the while. When enough ammonia has been added (this can be told by the fulminate turning to a chocolate color), add clean hot water to nearly fill bowl. When fulminate is all settled, pour off first wash very slowly into a stoneware jar and put one side. The fulminate is then given four washes with clean hot water.

After the last wash has been poured, add just enough cyanide to dissolve fulminate, pour into an enameled pan, add 2 or 3 qts. of water, add chemicals operator wishes to use, and boil over gas flame for at least 10 minutes.

Solution should actually boil for that period. After solution is boiled, add water to make desired quantity, heat to 180° F., and solution is ready to use.

The cause of the gold plate turning dark was caused by the ammonia and boiling will eliminate that.

The first wash that was poured into the jar should have more ammonia added, dissolved in cyanide only, boiled and added to solution.

JOSEPH CASLIO

Providence, R. I.,
July 29, 1929.

Revision of Copper Tube Specification

The Federal Specifications Board, Washington, D. C., is adopting and promulgating purchase specifications for commercial commodities purchased by the various departments and establishments of the United States Government. These specifications, in the formative stage, are submitted to representative manufacturers for their comment and criticism. The Federal Specifications Board would be glad to receive any comments or suggestions as to changes which may be thought to be desirable in the specification. Such comments or criticisms will have to be received by the Board not later than September 23, 1929.

It is now proposed to revise United States Government Master Specification No. 287 on seamless copper tubing and on seamless copper pipe in standard iron pipe sizes. A complete copy of the proposal may be had upon application to the Board mentioning the above number.

Defective Nickel Solutions

To the Editor of BRASS WORLD:

Referring to your answer in the May issue to our inquiry on "Defective Nickel Solutions," on page 120:

The sample of black nickel solution that we forwarded to you contained the following: nickel chloride, zinc sulphate, ammonia sulphocyanide, ammonia chloride and copper sulphate.

Your answer gave as analysis: metallic nickel, 1.86 ozs.; chloride, as ammonia chloride, 2.27 ozs.; and pH, 6.8.

We would like to know why there should be this difference, and the meaning of pH.

Also, in your acid copper formula you state "28 ozs. of copper sulphate." Please advise if this is in solution or in crystal form?

Rochester, N. Y.,
July 25, 1929.

ROCHESTER METAL ETCHING
COMPANY

Compound Cuts Down While Polishing

Harrison and Company, Haverhill, Mass., have been manufacturing for the past five years a compound which performs the operations of cutting down and polishing at the same time, it is announced. The substance, known as No. 4AAAA Black Regular, has been used with success on Monel metal and other hard, resistant metals, giving desirable results with the usual lathe or buff speed of 2800 to 3000 revolutions per minute. The makers state that the product is produced in special machinery which turns out a finer compound than can be made by hand operations as the blending is smoother and more perfect, assuring extreme uniformity at all times. Free samples of the compound are available upon request to the manufacturer.

Stripping Die Castings

Q.—Can you recommend any method of stripping chromium and nickel from die castings without injury to the base metal?

A.—The usual method of stripping chromium and nickel from die castings is to first remove the chromium deposit in a solution made of 12 ozs. of sodium cyanide, 2 ozs. of caustic soda and 1 gallon water. Use the reverse current and let work remain in solution just long enough to remove the chromium deposit. This only requires a minute or so.

To remove the nickel deposit, place in a solution made of 2 parts sulphuric acid and 1 part nitric acid. Keep all water from this dip. It is necessary to watch work closely and if work is taken from dip before all nickel is removed, it must be dried before placing again in the dip.

If the die casting contains a very small amount of zinc, the surface of the work will remain quite smooth.

—OLIVER J. SIZELOVE.

Low Voltage Plating Generator

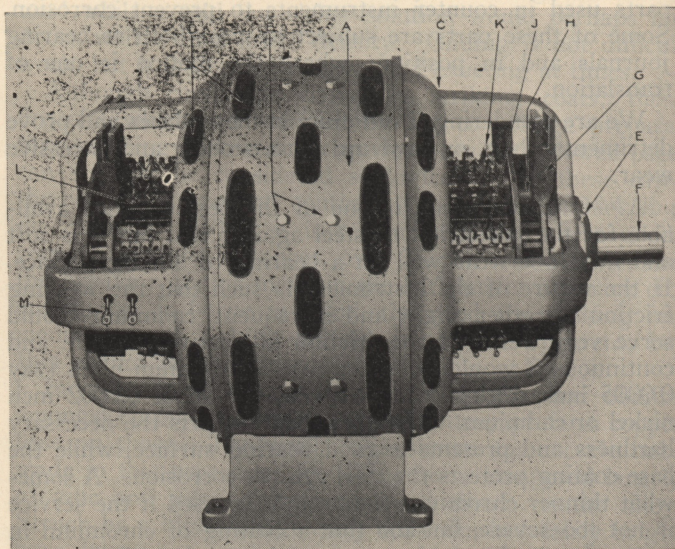
A newly designed low voltage generator for use in electroplating has been placed on the market by the Columbia Electric Manufacturing Company, 1292 East 53rd Street, Cleveland, Ohio. This apparatus is rated at 6 volts, 6000 amperes. It is of double commutator type, weighs 2,275 lbs., and is 33 inches high. The manufacturers give the following mechanical and electrical specifications:

Welded steel frames having more than twice the magnetic permeability of cast iron and designed on uniform electrical and mechanical lines. Laminated poles made of high grade sheet steel, held to frame by two bolts which prevent turning or loosening. Channel shaped end bracket arm cross section to maintain rigidity and reduce weight. Ventilated end bracket ring fitting into machined recess in field frame. Forced ventilation and cooling through openings in frame and end brackets. Timken double row roller bearings. Alemite lubrication. Extra large diameter shafts of fibrous core chrome-manganese steel. Integral cast copper collector ring and terminal with sufficient cross section and width to carry over twice the rated amperage.

Fibre rocker arm separating collector rings to prevent short circuiting of positive and negative terminals. Slots in rocker arm to permit adjustment for commutator wear. Integral cast brush holders, fully machined and centered, permitting use of at least 90% of brush length. Brushes of metallic graphite composition, designed to eliminate friction and sparking at light loads and heavy overloads. Brush shunts of ample carrying capacity. Brush holder spring permitting simple adjustment in brush tension. Easy inspection or replacement of brushes by means of thumb screws, without necessity of dismantling.

Separate excitation as positive preventive against reversal of polarity, with terminals brought through end bracket. Cross connected commutators assembled from

pure high grade copper and insulated with pure amber mica. Armatures of larger units built on spider, for ventilation, with laminations made of high grade electrical sheets, individually insulated to reduce eddy currents and hysteresis losses. Windings perfectly insulated and held



Low Voltage Generator

in place tightly in armature slots. Coils consisting of a number of small conductors of rectangular cross section and wound on armature to eliminate crosses between two halves of winding.

This line of low voltage Columbia generators includes a range of sizes for various uses. Complete information is available upon request to the manufacturer.

Easy-Operating Ball Burnisher

A new type of ball burnishing barrel which is said to require only a fraction of the motive power used by other types of apparatus for the same purpose has been developed by Lasalco, Inc., St. Louis, Mo. The makers state that this barrel is supported around the center by a heavy roller bearing containing 24 rollers which are kept properly spaced by means of two container rings. The rollers revolve between the accurately machined

inner surfaces of the supporting ring and the machined raceway around the middle of the barrel.

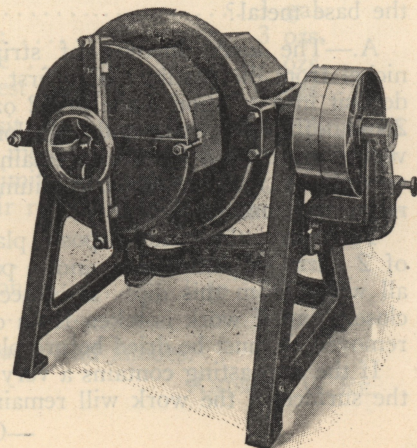
Practically the entire load is carried on this bearing, the makers state, which accounts for the low motive power required to revolve both barrel and work, as compared with the usual overhanging type of equipment.

The drive mechanism for the machine is stated to be simple, durable and positive in action. It consists of a short shaft carrying the tight and loose pulleys, as shown in the illustration, and a beveled pinion on the inside end of the shaft which meshes with a large ring gear. The ring gear is bolted to the roller base on the barrel and is said to be easily removable and replaceable. The company has published Bulletin No. 9 which gives full information as to the method of operation of this equipment and complete details of construction, besides considerable information in general on the subject of burnishing.

G. Cannon Correction

Through an error, the name "G. Cameron" was printed under an illustration on page 162 of our July issue. This should have read G. Cannon, Matchless Metal Polish Company, Chicago, Ill., who was elected vice-chairman of the International Fellowship Club.

Ball Burnishing
Barrel



Racks for Chromium Plating

A new series of racks especially designed for suspending work in tanks for chromium plating has been placed on the market by the Belke Manufacturing Company, 2863 Van Buren Street, Chicago, Ill., widely known manufacturers of equipment for electroplaters. The company states that these racks have been designed with the idea in mind that a considerable part of the success attained in chromium plating depends upon the racks used for holding the work in the solution.

The series consists of six standard racks with which, according to the Belke engineers, most chromium plating work can be done. The racks are so designed that a great number of different sizes and types of article can be plated on them. The racks are built on spines of heavy composition having exceptionally long life, it is stated, and the tips which hold the work are replaceable and adjustable, so that they can easily be made to conform to varying uses.

For work to which these standard racks cannot be

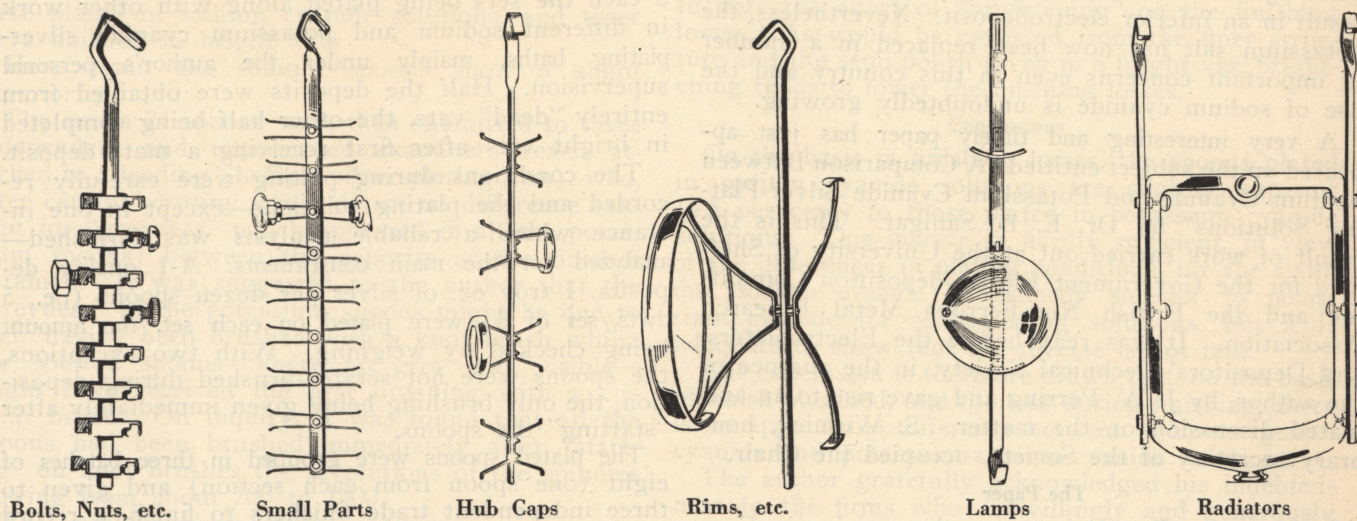
adapted, the Belke company is prepared to design and produce suitable racks to order.

The standard racks in this series are supplied without covering. In order to meet the demand for racks having insulated spines, the company has developed a special composition which will withstand the action of chromic acid. The spines can be supplied with a covering of this compound and will thus be insulated for periods ranging from six months to one year, the makers claim. For protecting racks for a more limited time, the company can provide a lacquer with which the racks can be painted in the shop.

The manufacturer states that these standard racks are suited to all shops, large or small. Special covering their use in the chromium plating industry can be obtained from the Belke company upon request.

The illustration shows a set of six standard racks with work attached, demonstrating a variety of typical articles for which the racks are suited.

Racks for Chromium Plating Various Articles



Lacquer for Bronzing

A new development in bronzing lacquer is announced by the Roxalin Flexible Lacquer Company, Inc., Long Island City, N. Y. The new type of lacquer, used for mixing with bronze powder, will not jell or discolor for 36 hours or more after mixing, the makers state. The advantage of this is the saving of waste caused by loss of lacquer left overnight when it cannot be used up the same day it is mixed. The usual lacquer mixed with bronze powder, they state, will form a stiff jelly if left for a period, due to the action of the bronze powder and lacquer mixture. A further saving is made with the new lacquer by eliminating time wasted for mixing fresh batches in small quantities for spraying during the day.

The Roxalin company states that tests made with the new type of lacquer, one gallon of which was mixed with one pound of bronze powder for one test, and one gallon to two pounds of bronze powder for another test. Each of these mixtures was allowed to stand for 96 hours.

Upon examination at the end of 36 hours, the mixture of one gallon to one pound showed no jelling and no discoloration, while the one gallon to two pounds mixture showed no jelling and slight discoloration. At the end of 96 hours there was no jelling and only slight discoloration in the thinner mixture, while the heavier mixture showed both a jelly formation and discoloration.

Excessive Gassing in Brass Solution

Q.—I am using a brass solution for plating on iron lamp castings. This work is finished on one wheel using No. 70 emery, so that a good plate must be applied. It is work that should be done in 30 to 40 minutes of plating at about 250 amperes. With the solution I am using, the gas gets pretty bad and I am having a hood installed to carry off some of the gas. I am sending you a sample of the solution. Does it seem all right to you?

A.—Brass solution analyzed as follows:

Copper	5.51 ozs.
Zinc	0.67 oz.
Free cyanide	3.95 ozs.

Analysis shows solution to contain 90 per cent copper and 10 per cent zinc. A high amperage would be necessary to obtain a brass deposit from a solution with the metal in this ratio and the gas that is given off is due to the high amperage used.

We would recommend the addition of 1 oz. of zinc cyanide to each gallon of solution. Dissolve the zinc cyanide in an equal amount of sodium cyanide before adding to solution. This addition of zinc to the solution will make a metal ratio of 82 per cent copper and 18 per cent zinc, which should produce a good yellow brass if used at the proper temperature and current density.

—OLIVER J. SIZELOVE.

Sodium Versus Potassium Cyanide Silver Plating

Paper Read Before British Society
Justifies Use of Sodium Cyanide
as Advocated in American Practice

By OUR LONDON CORRESPONDENT

WRITTEN ESPECIALLY FOR BRASS WORLD

UNTIL recently, potassium cyanide was used exclusively in silver-plating solutions, but within the past year or two its replacement by sodium cyanide, which is considerably cheaper, has received careful consideration and has resulted in its adoption in a number of silver plating establishments. It has found very wide favour in the United States, but in this country there has existed a rooted prejudice against the use of sodium salt, which is said to result in an inferior electrodeposit. Nevertheless, the potassium salt has now been replaced in a number of important concerns even in this country and the use of sodium cyanide is undoubtedly growing.

A very interesting and timely paper has just appeared on the subject entitled "A Comparison Between Sodium Cyanide and Potassium Cyanide Silver-Plating Solutions" by Dr. E. B. Sanigar. This is the result of work carried out at the University of Sheffield for the Government Electro-deposition Committee and the British Non-Ferrous Metal Research Association. It was read before the Electroplaters' and Depositors' Technical Society, in the absence of the author, by J. W. Perring and gave rise to an animated discussion on the matter. S. Wernick, honorary secretary of the Society, occupied the Chair.

The Paper

In his paper, Dr. Sanigar says that opinion in England remains divided upon the advisability of using sodium cyanide for silver-plating solutions. Many platers still feel that potassium cyanide is preferable, and among the reasons given to the author for the supposed inferiority of the cheaper sodium cyanide are the following:

1. That sodium cyanide silver-plating solutions give rougher and coarser crystalline deposits than do potassium cyanide solutions, so that
2. Deposits which are easily "finished" are not so readily obtainable from sodium cyanide solutions;
3. Sodium argento cyanide deposits cannot, therefore, be "finished" without undue loss of silver, whilst
4. The fine finish demanded on Sheffield silver-plated goods could not be obtained from sodium cyanide solutions.

In order to determine whether potassium cyanide had any marked superiority, from the point of view of deposit, over sodium cyanide, the finishing properties of silver deposits from the two types of solution have been examined. It was thought preferable to have the tests made on trade deposits, and to have the deposits finished by experienced finishers, rather than for it to be simply a laboratory comparison. The co-operation of trade platers and trade finishers was secured, and the test carried out on commercial

deposits which were plated during ordinary routine work. This resulted in slight differences in plating conditions although these were with the exception of the current densities used, very similar.

Experimental Details

Twenty-four exactly similar spoons were given to the author for the test and buffed by the same person. These were marked and divided into 8 sets of 3 each the sets being plated along with other work in different sodium and potassium cyanide silver-plating baths, mainly under the author's personal supervision. Half the deposits were obtained from entirely "dead" vats, the other half being completed in bright vats after first receiving a matt deposit.

The conditions during plating were carefully recorded and the plating solutions—except in one instance where a reliable analysis was furnished—analyzed for the main constituents. A-1 quality deposits, 1 troy oz. of silver per dozen spoons (i.e., 5 dwts./set of 3) were plated on each set, the amount being checked by weighing. With two exceptions, the spoons were not scratch-brushed during deposition, the only brushing being given immediately after "starting" the spoons.

The plated spoons were grouped in three batches of eight (one spoon from each section) and given to three independent trade finishers to finish, a record being kept of each finisher's opinions as to quality of deposit and finishing properties, and also of his remarks on each spoon. The "key" to the markings on the spoons was unknown both to finishers and examiners.

The finishers summarized their impressions of the deposits as follows:

Finisher A.—There was no very big difference between the deposits on burnishing. All were good on lining, with no big differences except 20 and 3 where the difference was due to the deposit. None of them dragged on the dolly with or without oil. All finished nicely.

Finisher B.—None of the deposits dragged on the dolly. No trouble experienced with any of them in the bowl. Impossible to distinguish between the sodium and the potassium spoons.

Finisher C.—All finished easily. All are good and a perfect finish can easily be obtained on them all.

The spoons were accurately weighed before and after finishing (care being taken to remove rouge, etc., from the finished spoons) and the results tabulated. From the average loss of each set of the finishing loss, in dwts./doz. spoons was calculated for each solution.

The following table shows the arrangement of the sections by increasing finishing loss in dwts./doz. It also shows the average loss for the sodium spoons and for the potassium spoons, and the percentage difference between the average values:

TABLE SHOWING FINISHING LOSSES IN DWTS., DOZ.

Plating Solution	Type of Bath	Finishing loss per doz. spoons in dwts.	
Sodium Cyanide	Dead + Bright	1.682	Less than average loss
Sodium Cyanide	Dead + Bright	1.744	
Potassium Cyanide	Dead + Bright	1.829	
Sodium Cyanide	Dead entirely	1.836	More than average loss
Potassium Cyanide	Dead entirely	1.890	
Potassium Cyanide	Dead entirely	1.906	
Potassium Cyanide	Dead + Bright	1.945	
Sodium Cyanide	Dead entirely	1.990	
Average loss for the whole 24 spoons =		.2442 gr./spoon	
		= 1.884 dwts./doz.	
Grand average loss/doz.	KAg(CW) ₂ spoons =	1.8925 dwts.	
"	" NaAg(CW) ₂ "	= 1.813 "	
Difference.....		.08 "	
		= 4.5% of 1.8	

The average loss for the whole 24 spoons was 1.884 dwts./doz., and it is an increasing result that, of the four sections which lost less than the average three were plated in sodium cyanide solutions, and three were finished in bright vats.

Here again the sodium spoons show a slight superiority.

The entire 24 spoons were then submitted to three independent and experienced examiners (each attached to a leading Sheffield silver-plating firm), who, after careful scrutiny, could detect no difference (except for "greyness" which appeared in all the potassium spoons) between the deposits or the finishes obtained. It was suggested to the author that the "greyness" in the potassium spoons might be due to their having been brushed with a knot brush whilst the sodium spoons—where no grey was visible—might have received the first brushing with a circular brush. On inquiry, it was found that all the spoons had been brushed immediately after "starting" on knot brushes the revolutions of the spindles varying from about 700 to 1400.

The opinions given by the examiners were:

Examiner A.—"Impossible to tell any difference between the spoons, and none could be selected as inferior to any other."

Examiner B.—"Not possible to detect any difference between the two sets of spoons. Could not pick out any as worse than the others (apart from grey). The sodium deposits are in no way inferior to the potassium ones."

Examiner C.—"No difference between any of them."

An attempt was made to secure photographs of the deposits as they came from the solutions, but, owing to the fact that there were no plane surfaces on the spoons, it was found impossible to obtain satisfactory focus, and hence no comparable photographs could be obtained.

Anodes

Special attention was paid to the anodes (which were removed for inspection) in the sodium argento cyanide solutions. The anodes were not bagged, and had a well-defined crystalline structure, being comparable in every respect with good anodes from potassium cyanide solutions. There was no loose powdery surface film on the anodes, and no such trouble had been experienced; neither had the users of sodium cyanide experienced any freezing out of sodium carbonate. (The amounts of sodium carbonate in the solutions are well below the saturation value of the salt at 18° C. (64½° F.) Sodium carbonate had been purposely added to the vat used in Section No. II to improve the deposit).

Current Densities Used

Of interest is the fact that the current densities used for sodium cyanide solutions were much higher than those used with the potassium solutions. This would seem to be an idiosyncrasy of the platers rather than a property of the solution for high current densities are also used with potassium cyanide solutions. (See F. C. Mesle, "Silver-Plating," American Electroplaters' Monthly Review, 15, No. 10, November, 1928, where current densities of 15 amps./sq. ft. are indicated with potassium argento cyanide solutions.)

A high current density in silver-plating tends to produce a softer deposit (author, Trans. Farad., Soc. 24, No. 91, p. 1, 1929), but up to certain values, usually a coarse deposit. This coarseness of deposit makes for high finishing losses. High current density alone does not always produce a coarse-structured silver deposit (author, loc. cit., p. 6). The spoons in this section, which lost least in finishing were plated at 9 amps./sq. ft. and practically the whole of the deposit was put on in the bright vat.

Apart from the comparison in hand, it is interesting to note the effect of "brightening" on the finishing losses. As would be expected from the finer structure and the semi-polish given in a bright vat, brightening tends to lower the finishing losses.

Conclusions

On the basis of finishing losses, the spoons plated in sodium cyanide solutions are slightly superior (4.5 per cent) to those plated in potassium cyanide solutions. This margin is hardly sufficient, in view of the differences in plating conditions, for the claim that sodium cyanide is distinctly superior to potassium cyanide for silver-plating solutions, but it is adequate to show that the reverse is not true.

The conclusion is therefore drawn that, on the basis of finish obtained, and the loss during finishing, there is no appreciable difference between sodium-argento-cyanide and potassium-argento-cyanide solutions.

The author gratefully acknowledged his indebtedness to the firms who so willingly and generously co-operated in the plating, finishing and examination of the spoons, and particularly for their kindness in allowing the personal supervision of the plating and recording of the plating conditions. Without their expert help and criticism, the test would have lost much of its value.

Discussion

Opening the discussion, **Mr. Wernick** said they were indebted to the author for his very interesting paper, the practical value of which was enhanced by the fact that it was the result of work carried out under actual works conditions in silver-plating establishments, the "home of the silver-plating industry." The results obtained would have been more valuable if in the first place, a solution containing only sodium cyanide and no potassium cyanide whatever had been used. No doubt economic considerations made this difficult, but alternatively it would be useful if the author would give the proportions of sodium and potassium cyanide in the "sodium" bath. Secondly, it was unfortunate that a larger number of samples had not been used. It would have been more convincing if each operator had had more than one sample only from each of the eight kinds of bath to finish.

S. Field said he welcomed the paper for several reasons: Firstly, as being a record of work carried out under the direction of the Department of Scientific and Industrial Research; secondly, because it was carried out under actual shop conditions.

In regard to hardness of the deposit, this was not affected by the sodium salt, but only by the quantity of free cyanide in the solution.

Sodium salts were used largely in America without trouble. The actual difference in the result as worked out from Dr. Sanigar's figures, was as low as 2 per cent.

The fact that satisfactory results were obtained in a solution which had been converted by the addition of sodium cyanide, was a convincing argument in favor of its adoption in the trade. There was very little difference between the two cyanides except for solubility and conductivity.

S. E. Weill said that sodium cyanide was actually superior to potassium cyanide in silver solutions. It was not realized that the mixed salt which was largely used, contained a considerable proportion of the sodium salt. In regard to finishing, polishing after plating was not really necessary.

A. Ensor wished to know the quantity of sodium salt which had been added to the potassium solution, and the length of time it had worked in this condition. He would have liked to see the spoons put in use for some time and their condition reported. A hard deposit was not always best, being sometimes

brittle and inferior to a soft deposit in wear. His experience of silver-plating from sodium solutions was that it was unsatisfactory.

D. Weil said that after many years' experience with sodium cyanide solutions, he was of the opinion that there were no special difficulties. The author's work showed that the cathode efficiency and the conductivity were satisfactory.

The deposit was easily finished but showed very little finishing loss. There was no doubt that the two cyanide salts were equivalent.

F. L. James said the drawback to the work was that in reality mixed salts had been used.

S. E. Weill said results often depended on the metal content of the solution. Regular analyses should be a more frequent practice.

L. Goring suggested that metal content did not affect the deposit as much as cyanide content.

A member said he had perfectly satisfactory results with sodium salts over a period of several years' continuous working. It was nevertheless to be regretted that the author had not tried the pure sodium salt alone.

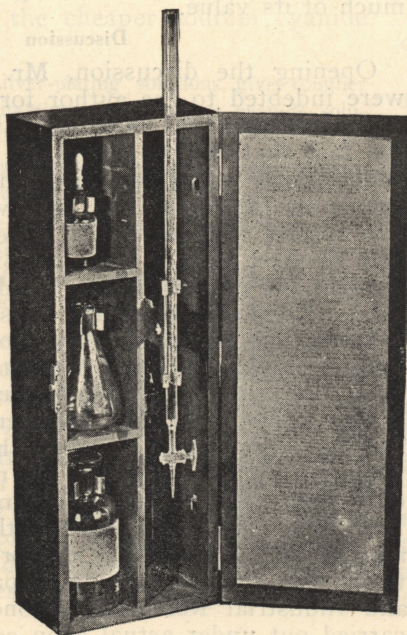
In the unavoidable absence of the author, J. W. Perring replied to the discussion.

Plating Solution Control Apparatus

A set of apparatus designed for control of solutions for electroplating has been developed and placed on the market under the name "C. I. C. Titration Set" by the Walter S. Wood Company, Boston, Mass. The set, as shown in the illustration, was developed for easy measurement of chloride ion concentration in nickel solutions. The apparatus presents the results in terms of ounces per gallon without necessity of conversion from other terms by calculation.

The apparatus is designed to insure safe portability and freedom from mechanical difficulty in operation, the makers state. The set is compactly enclosed in a dust-proof box, the various units being fastened in by spring clips which firmly hold them in place. The box, furthermore, serves as the support for the apparatus when it is in use.

The company claims that a carefully prepared instruction sheet is provided which makes chemical knowledge unnecessary for manipulation of the apparatus in determination of the chlorides in solutions or in adjustment of the solutions in conformity with the results of the measurement.



Solution Control
Outfit

Metallic Columbium

Tantalum, a rare but fairly well known metal, was first produced in the United States by Dr. C. W. Balke, chemical director, Fansteel Products Company, North Chicago, Ill. At the last Exposition of Chemical Industries in New York, Dr. Balke displayed another metal which he was the first to produce in this country, columbium, which has a number of properties similar to tantalum, including a silvery appearance.

The first columbium was noted as an element by Hatchett, in 1801, who gave it its name because the mineral in which he found it came from America. Its atomic weight is 93.5, its specific gravity 8.3 and its melting point about 1950° Centigrade. Its silvery surface can be coated with iridescent, many colored oxides by electrolysis, but, like tantalum, it is extremely difficult to attack otherwise. It is inert to practically all chemical action, a property in which it again resembles tantalum, and it is soluble only in a mixture of nitric and hydrofluoric acids. In electrolytes the metal is uni-directional. Columbium will absorb gases readily by occlusion and for this reason it has been patented as a "getter" in vacuum tubes. It is very ductile and can be worked well without heating, by rolling, drawing, hammering, forming, and can be cut easily by ordinary metal working tools. By the spot welding process it can be joined to itself and to other metals, although care must be taken not to subject it to very great heat in atmosphere or it will become brittle.

The exhibit at New York consisted of several pounds of the metal in bars, sheets, rods and wire. Except for a half ounce produced by Siemens in 1906, the Fansteel exhibit included all the metallic columbium thus far produced anywhere. It was the only occasion ever when so great a percentage of the world's supply of one metal was exhibited in one place in the United States.

Columbium is valued at about one-seventh the price of platinum and one-half that of gold. However, the difference in weight makes columbium even cheaper than these comparisons would indicate, so that it is expected to find many uses where hitherto the noble metals—gold, silver, platinum, etc.—have held sway due to their non-corrosive properties or their beauty.

Tin Solution Operation

Q.—We made up a tin solution according to a formula which you sent us and the results have been satisfactory.

The solution has been in operation about a week, but in the last few days the anodes have taken on a black coating. This does not stop the plating action but we would like to know whether the anodes should have this coating, and, if not, how we can get rid of it.

The solution is made up according to this formula but we have been operating it at a temperature of 150° F. instead of 120 as you recommended.

We find that at 120° the plate is somewhat streaked, while at 150° it is more uniform and better looking.

Our only complaint with the solution is the black film that forms on the anodes. We get good results from it otherwise.

A sample is going to you under separate cover.

A.—The black coating on the tin anodes may be due to impurities in the tin. If the tin contains any lead, the coating referred to would be formed.

The anode surface should be equal or larger than the cathode surface.

Increase the potassium hydroxide content of the bath by adding 1 ounce of potassium hydroxide to each gallon of solution.

We do not believe that the dark coating of the anode will do any harm and if the bath operates better at 150° F. than at 120° F., operate it accordingly.

—OLIVER J. SIZELOVE.

Antique Brass Finish

Q.—Please let me know how to put an antique brass finish on iron castings, or on copper plated iron castings. The finish should make it look like brass about fifty years old.

A.—As there are several different finishes and methods of producing finishes that are called "Old Brass," it is quite difficult to know exactly what you wish. If you

had sent a small sample with finish desired, it would have been much easier. Try the following formula:

Copper sulphate	8 ozs.
Nickel sulphate	2 ozs.
Hyposulphite soda	8 ozs.
Water	1 gal.

Dissolve the copper sulphate and nickel sulphate in boiling water and then add the hyposulphite of soda. Use solution near boiling point and immerse until smut appears. Scratch-brush or relieve on rag wheel with pumice.

Another formula that can be used to produce an "Old Brass" finish is as follows:

Single nickel salts	1/2 oz.
Hyposulphite soda	8 ozs.
Water	1 gal.

Use this at 180° to 200° F.

—OLIVER J. SIZELOVE.

Red Enamel on Silver

Q.—I have been having some trouble with applying red enamel to silver. I do not have much silver to enamel and I get good results with all my colors except red. In preparing I have used the nitric method; that is, nitric acid pickle and one to three nitric wash. I have also tried the sulphuric method and have used sulphuric with bichromate of potash. The red usually stands up well until the final stoning. In the final fire for glazing the red fades out, becoming brown. I feel certain it is not the enamel or the silver but something in my method. Can you advise me on this?

A.—Your trouble with the red enamel is common and has been experienced by others. It seems that there is more trouble encountered with the red color than with the other colors. The only suggestion we have to offer is to be as careful as possible and keep the temperature in the firing operations as low as possible.

—OLIVER J. SIZELOVE.

Comparison Between Metal Coating Processes

An article under the above title appeared on pages 170-171 of our July issue. In the paragraph before the last on page 170, the following reference was given: "The difference in the composition of coatings between

various metal coating processes is illustrated in Figs. 1 to 4." The illustrations, however, were omitted through error and are here printed to make the article complete. The four illustrations refer to four coating processes.

Zinc containing small amount Fe Zn₃

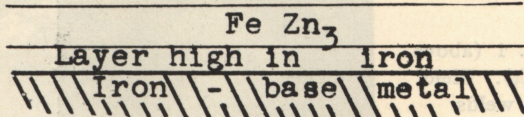


Fig. 1. Deposit Obtained in Galvanizing

Zinc

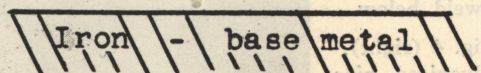


Fig. 2. Electrodeposit

Zinc

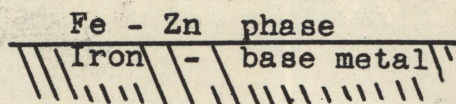


Fig. 3. Sherardized Deposit

Zinc-iron alloy, containing various amount of iron.

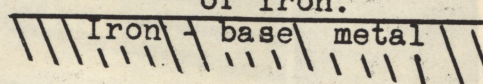


Fig. 4. Sprayed Deposit

How to Weld Galvanized Iron

Procedure Used in Joining Galvanized Iron Parts with Steel or Bronze Welding Rod*

GALVANIZED iron is used extensively for service conditions where uncoated iron or steel would be subject to serious corrosion. The coating of zinc which forms the galvanizing is applied by immersing the iron base material, whether sheet, pipe or other form, in molten zinc. A layer of flux on the surface of the zinc bath cleans the iron as it is introduced and insures a firmly adherent coating of zinc on the galvanized material. This process is known as hot-dip galvanizing.

Zinc has a relatively low melting point and also has the property of volatilizing when heated. Consequently, when galvanized material is heated the zinc coating does not melt and run on the surface, as might be expected, but instead the zinc vaporizes and burns, forming the familiar white fumes of zinc oxide. The welding of galvanized material results in the loss of a certain amount of zinc coating from the surface immediately adjacent to the weld.

Some welded products such as coils can be completely welded prior to the galvanizing operation. In such cases, of course, the problem of welding galvanized material does not enter as all of the welds are made in steel before coating with zinc.

For the welding of galvanized material either steel or bronze welding rod may be used. Welding with steel rod requires a higher temperature and thus removes more of the galvanized coating. This method is frequently used, however, where the welded part can be given a coat of protective paint after welding is completed. For most applications bronze welding is to be recommended, as the relatively low temperature has less effect on the galvanized coating.

Welding Galvanized Iron with Steel Welding Rod

One large manufacturer of carbon dioxide refrigeration systems has standardized on the use of steel welding rod for making field welds in galvanized coils used in air conditioning systems. Many installations have been made in office buildings and theaters. The coils are fabricated in sections at the shop, the shop welds being made before the section is galvanized. During installation the galvanized sections are welded together, using High Test steel welding rod. Fig. 1 shows a group of the field welds just after completion. The welds are later finished with a coat of aluminum paint, Fig. 2. Shop weld and field weld are contrasted in Fig. 3, the more abrupt bend being the shop made one.

No corrosion difficulties have been experienced due to possible loss of zinc coating from the inside of the pipe during welding. In this connection, it should be remembered that the cutting and threading of galvanized pipe also removes a certain amount of the protective zinc coating. Experience seems to indicate that the oxwelded joint in galvanized pipe is at least as good as the screw-coupled joint so far as internal corrosion is concerned.

Bronze-Welding Galvanized Iron Pipe

Bronze-welding has been found very effective for the installation of galvanized piping for water and other industrial services. The installation is made in exactly the same manner as a steel line. Pipe can be cut and beveled with the cutting blowpipe without serious injury to the galvanized coating, Fig. 4. It is then lined up, tack-welded and welded in accordance with the usual procedure for bronze-welding. The recently developed High

*From Oxy-Acetylene Tips, August, 1929.

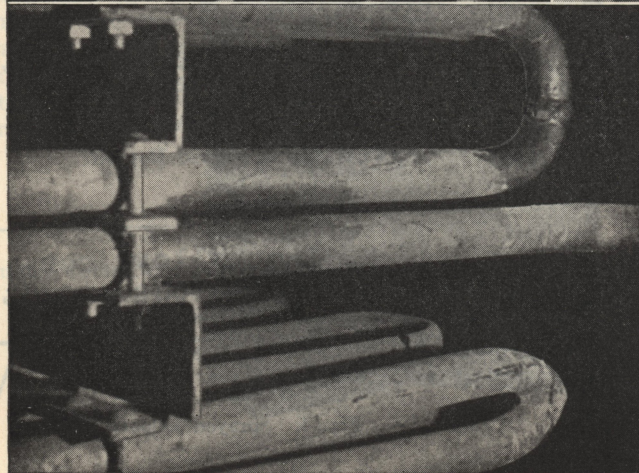
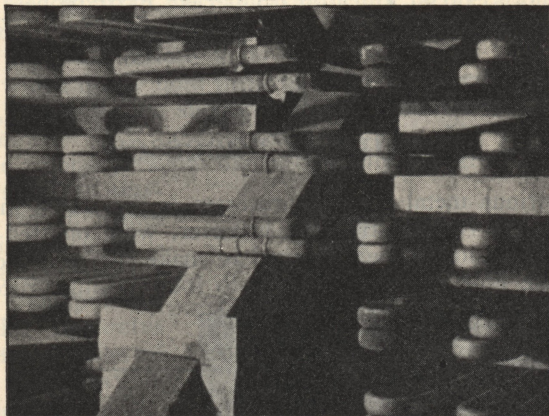
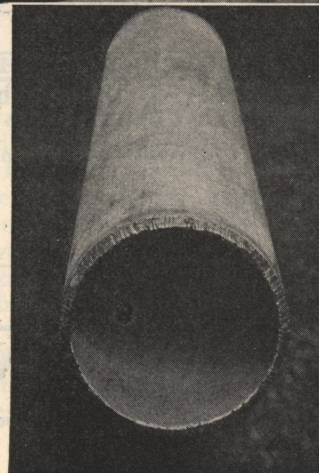


Fig. 1 (above, left). Field welds

Fig. 2 (above, right). After painting

Fig. 3 (left). Field weld above, shop weld below

Fig. 4 (right). Galvanized pipe beveled with blowpipe



Strength bronze rod is particularly recommended for bronze-welding galvanized iron. The completed weld presents a very attractive appearance and in practically all cases no coating of paint or other protective material need be applied. Fig. 5 shows the installation of a bronze-welded 6-in. galvanized water line.

Bronze-Welding Galvanized Sheet

Bronze-welding is also extensively employed in the fabrication of various articles from galvanized sheet. Many types of storage tanks and containers are made in this way.

The advantages of bronze-welded construction are well illustrated in the case of the gas bell of a widely used acetylene generator designed for household lighting systems.

Until recently the gas bell of this type generator was made of 20-gauge galvanized sheet steel. Vertical seam

leaks if handled roughly during shipment or in service.

To make the gas bell more substantial by increasing the thickness of the metal used to 18 gauge and to provide a method of manufacture that would insure the seams remaining tight, even though subjected to rough handling in transit or in service, it was decided to change to bronze-welded construction. The results have been all that could be desired. Previous to the adoption of bronze-welding, careful inspection of gas bells that were returned to the factory showed that 24 per cent had developed slight seam leaks. No leaks were found in any bronze-welded gas bells returned during a like period of four months. This record is the best kind of proof of the merits of bronze-welded construction. Tests made on a Riehle physical testing machine show the bronze-welded seams to be 315 per cent stronger than the soldered double-lock seams.

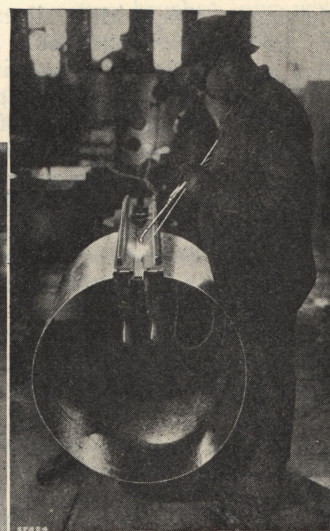
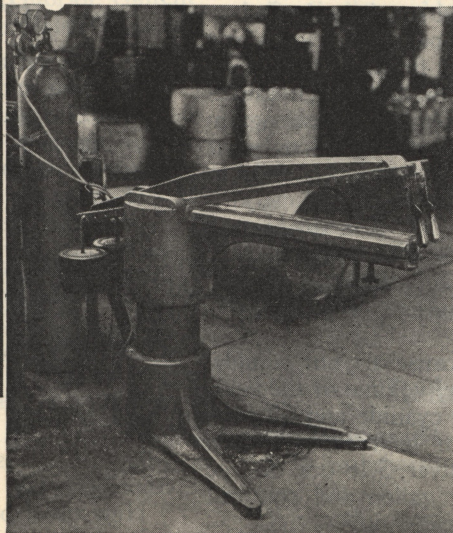
Several ingenious jigs were developed to facilitate the



Fig. 5 (left). Bronze welding galvanized water line

Fig. 6 (below). Jig for side seam

Fig. 7 (right). Rapidly welded with bronze



was of single-lock seam construction with solder sweated into the seam. The bell-top to bell-body seam was of double-lock seam construction with solder sweated into the seam. With this type of construction, thickness of the sheet metal used was limited to 20 gauge because of the difficulty in double-lock seaming heavier gauge material. It was also found that the seams would develop

fabrication of the bronze-welded gas bells. Fig. 6 shows the jig used in welding the vertical seam of the gas bell. This fixture consists mainly of a pair of welded arms which, when clamped into position, hold the sheet metal in such a way as to prevent all buckling and creeping. Copper inserts built into the fixture stakes assist in conducting heat rapidly away from the welding zone. Fig. 7 shows the vertical seam weld being made in this jig.

For holding the gas bell head or top in correct alignment with the shell the jig in Fig. 8 is used. It is shown in operation on the cover.

In addition, replacing a flanged fitting on the generator neck by a standard pipe nipple bronze-welded in place has materially increased strength, decreased the possibility of leaks and reduced cost.

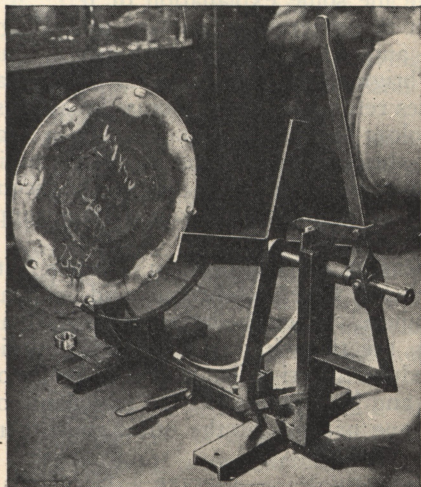


Fig. 8. For holding head in correct position

Tarnishing of Silver

Q.—We are handling a lot of silver pendants, chains and bracelets, and as I wish to get away from lacquering, I would ask you if you will kindly forward me a solution (not tin) to keep the work bright and free from tarnishing.

A.—There is no solution we know of that you can use in place of lacquer to prevent the tarnishing of your silver work.

—OLIVER J. SIZELOVE.

Chromium Raises Nickel Plate

Q.—We are having trouble chromium plating castings of brass containing 60 per cent of zinc. The chromium plate raises the nickel, and it seems to make no difference whether the work is copper struck or not. Without the chromium over it the nickel seems to hold perfectly. We are using a nickel solution containing 32 ozs. single nickel salts, 4 ozs. boric acid and 3 ozs. table salt.

A.—The indications are that your chromium solution is too acid. Add ammonia to get a pH of 6. If the results are not satisfactory, stir the solution thoroughly and send us a 3 oz. sample for analysis.

—OLIVER J. SIZELOVE.

Excessive Free Cyanide in Silver Bath

Q.—After forty years in the silver plating business, we are having trouble with a silver solution, sample of which we are forwarding to you.

We have a 200 gallon solution with a content of 3 ozs. silver to the gallon. We sand and grease buff nicely but after the articles, which are made of Britannia metal, are plated, they look as though they had not been buffed.

On hard metal articles such as copper and nickel silver the plate appears rough, as if satin finished, and is so stained that we have to grease buff again, which causes the plate to come off and the base metal to appear again.

Will you please analyze the solution and tell us what is wrong with it?

A.—Analysis of silver solution:

Metallic silver	3.58 ozs.
Free cyanide	14.38 ozs.
Carbonates	9.86 ozs.

Solution is high in free cyanide and the carbonate content is also high.

The excessive free cyanide is the cause of your trouble. We would suggest that you dilute the volume of the solution one half, add 400 ozs. of silver cyanide and fill tank to solution level with water. Your solution will then contain approximately 3.16 ozs. of silver, 5.18 ozs. of free cyanide, 4.93 ozs. of carbonates per gallon and you will have eliminated the trouble you are having.

—OLIVER J. SIZELOVE.

Installing Chromium Solution

Q.—Could you furnish me with a formula for preparing a chromium solution for use in a one-half gallon tank. We wish to plate small articles such as rings.

A.—Formula for half-gallon tank of chromium solution:

Chromic acid	25 ozs.
Sulphuric acid	0.15 oz. by weight
Water	1 gal.

The chromic acid should contain less than 0.2 per cent of sulphates and the sulphuric acid should be C. P.

You can use a half-gallon glazed earthenware crock and place in a wood or iron tank that will hold water. Means should be provided for heating the solution to 95° F., either by gas or steam. Use 6 per cent antimonial lead anodes and a cathode current density of 50 to 75 amperes per square foot. A suitable rheostat must be had to control the current as the proper current density is one of the main factors in producing a bright deposit. Write to the Superintendent of Documents, Government Printing Office, Washington, D. C., for a copy of Technologic Paper No. 346, which contains valuable information on chromium plating.

—OLIVER J. SIZELOVE.

Nickel Solution Analysis

Q.—I am having trouble with a nickel solution, a sample of which I am sending you for analysis.

A.—Analysis of nickel solution:

Metallic nickel	2.57 ozs.
Chloride, as ammonium chloride.	4.12 ozs.
pH	5

As you have not stated what trouble you are having with your nickel solution, we assume from the analysis that the deposit raises when color buffed or during an assembling operation. The solution is quite acid and we would advise you to add 6.5 ozs. of ammonium hydroxide (26°) to each 100 gallons of solution. The chloride content is also high, so do not add any more of this salt for some time.

If after making the addition of ammonium hydroxide to the solution you still have trouble, send another sample for analysis, state exactly what trouble you are having, and also send a small sample piece that has been plated in the solution.

—OLIVER J. SIZELOVE.

Costs of Tinning and Cadmium Plating

Q.—Please advise us as to the difference in costs of hot tinning and cadmium plating.

A.—This question is quite hard to answer without knowing what class of work is to be finished and for what purpose the work is to be used after finishing.

If you are equipped to do electroplating, we would say that cadmium plating would be cheapest from the installation viewpoint. If we consider the cost of the metal, cadmium is more expensive than tin, the former being worth about ninety-five cents and the latter fifty cents a pound according to quotation at time of writing.

—OLIVER J. SIZELOVE.

Data on Brass and Chromium Plating

Q.—What is the difference between brush brass and colonial brass finishes?

How can I produce an imitation gold finish?

In referring to a chromium solution, what is meant by "changing over" the solution? One of our chromium baths has lost its usual throwing power and to remedy this we have been advised to suspend oblique porous jars in the center of the tank and inside of the jars to suspend lead anodes having metallic contact with the cathode bar, and to keep the current flowing constantly through the solution. I could not get an explanation of what this process does other than that it "changes over" the solution. Can you give me some explanation of it?

A.—There are in use several methods of producing a brush brass finish and when the brush finish is quite smooth and a little brighter than the ordinary brush brass finish, it is sometimes referred to as a colonial brass finish.

Imitation gold colors are usually produced on a brass base by lacquering the work and then using an aniline dye to give the lacquer a gold color. Any of the lacquer manufacturers that advertise in this journal can supply you with this dye.

The three constituents of a chromium solution after operating for a period of time are chromic acid, sulphate, and tri-valent chromium. When the latter increases to any considerable extent, the throwing power of the solution is decreased. To reduce the tri-valent content, the porous pot method is used and by this method the tri-valent content is changed to one or both of the other constituents of the bath.

—OLIVER J. SIZELOVE.

Solution Analyses

Q.—We are sending two samples of plating solutions for analysis, one being a black nickel solution for plating black background on etched name plates. This solution does not give results at this time, although when we first used it we had no difficulty. Can you make an analysis of this to determine where the fault lies?

The other is a white nickel solution which is working satisfactorily, but having lost the man who made it up, we cannot make up another tank of it. Can you please give us the formula?

Analysis of white nickel solution:

Metallic nickel	2.21 ozs.
Chlorides	0.35 oz.
pH	6.

The metallic nickel would correspond to a solution that contains 10 ozs. of double nickel salts, 4 ozs. of single salts and .35 oz. of ammonium chloride. The pH is also a little too high.

If you wish to make a solution from the above formula, we would suggest that you increase the chloride content by using 2 ozs. of ammonium chloride and also 2 ozs. of boric acid.

Analysis of black nickel solution:

Metallic nickel	2.29 ozs.
Chlorides	4.85 ozs.
Sodium sulphocyanide	1.30 ozs.
Metallic zinc	.16 oz.
pH	6.2

We would suggest that you add to this solution 1 oz. of sodium sulphocyanide, $\frac{1}{2}$ oz. of zinc sulphate. If the deposit is not black enough, add 2 ozs. of copper cyanide dissolved with 2 ozs. of sodium cyanide to each 100 gallons of solution.

—OLIVER J. SIZELOVE.

Finishing Dials

Q.—You recently answered an inquiry as to a method of finishing dials. In this you assume that the dials are etched. These dials are not etched. Sample was stamped out on a punch press. You did not give me a formula for the silver solution with low free cyanide content. Will you please give me the required information? I would also like to know what the resist is that you mentioned.

A.—The sample dial was produced by the method outlined in our previous answer. This is the usual method of producing this work.

The resist is made by dissolving asphaltum in turpentine to the proper consistency and the etching agent is a solution of chloride of iron.

If the dials are to be made on a punch press a slightly different method will be necessary.

After the dials are stamped they should be clean from oil or grease and blackened in the ammonia carbonate copper black. They are then placed on a chuck on the end of a lathe operated at 1200 to 1400 r.p.m. and the finish is produced by a fine grade of emery cloth which is placed against the revolving dial. This operation will remove the black from the surface of the dial and leave the background black.

Plate for a few minutes in a silver solution that has a metal content of 2 oz. silver and 1 oz. free cyanide per gallon, using a low current density. After silver plating, scratch-brush wet, very lightly, dry and lacquer.

—OLIVER J. SIZELOVE.

Verde Antique Finish on Brass

Q.—I would like to know how to produce a verde antique finish on brass lamps. I have tried out a number of methods that seem to be impractical and wonder if you can give me information that will prove useful in the actual shop.

A.—Verde antique finishes are of various types and shades, depending upon the coloration desired. The manipulations are also varied, depending upon the effect desired. The following solution will give a dark green verde.

First, bright dip your brass articles and then immerse in the following solution:

Muriatic acid	1 gal.
White arsenic	1 lb.
Copper sulphate	2 ozs.

This will produce a dark coating of arsenic upon the brass. Then stiple; use two brushes, one wet and the other merely moist, with the following solution:

Water	1 gal.
Acetate of copper	8 ozs.
Sulphate of copper	4 ozs.
Sodium chloride	2 ozs.
Glycerin	2 ozs.

Dissolve in 1 gal. of muriatic acid, 1 lb. of white arsenic, heating moderately to aid solution. When this is cold, mix the above solution with it. Allow to settle and pour off clear solution. Use only the clear solution. After the first coat has been applied with a very moist brush, stiple over with damp brush; allow to hang in atmosphere for 2 or 3 hours; then run article through cold water and hang up again to dry. A dark green verde will develop. After 2 or 3 hours, lacquer, wax up and color.

—JOSEPH HAAS.

Refinishing Watch Dials

Q.—We would like to have information that will enable us to refinish dial and meter faces in a uniform satin finish.

We understand there exists a particular method used by clock manufacturers, this method being the application of a compound over the face which is left for a short period then removed, leaving an attractive satin silver finish. The lettering and figures remain unharmed through the process.

Do you know where we may obtain this compound and the material used for the lettering? Is the latter something special?

A.—It is quite a difficult job to refinish dial and meter faces without injury to the letters or figures. You could probably make a stencil or shield to place over the letters and then use the sand blast to produce the satin finish. We are not familiar with the method or the compound of which you speak.

—OLIVER J. SIZELOVE.

Foam at Cathode in Nickel Bath

Q.—What causes a nickel solution to throw off foam at the cathode?

A.—If zinc has been introduced in the nickel solution in any way, this may be the cause of the solution gassing at the cathode. Organic matter when used for brightening the deposit, such as glue, dextrose or any of the gums, will cause gassing at the cathode, especially if a high current density is used.

Send us a sample of the solution for analysis so that we can advise you further.

—OLIVER J. SIZELOVE.

Throwing Power of Chromium Bath

Q.—We have been doing chromium plating for several years on a comparatively big scale, with wonderful success. Our baths to date have been operated according to the methods given by the Bureau of Standards, using sulphuric acid as the sulphate radical.

Several days ago we noticed that the gasing at the cathode looked rather strange. Instead of the hydrogen forming large gas bubbles and bursting, as is usual in these solutions, the gasing was very fine and hardly any bubbles formed on the surface of the solution. This bath is operating nicely on chromium strike work over nickel, but has very poor throwing power on dies and pieces requiring a heavy plate.

We are of the opinion that an acid radical has entered this solution from rinse waters, resulting in the sulphate content becoming too high.

We are sending, under separate cover, a six-ounce bottle of this solution for analysis, and ask that you advise us of the condition of this bath.

Do you recommend the precipitation of the sulphate with borium chromate in a 250 gal. tank? If so, what procedure would you advise and what quantities of this chemical would you use?

A.—Analysis of chromium solution:

Chromic acid	30.19 ozs.
Trivalent chromium	0.78 oz.
Sulphate	0.39 oz.

The analysis shows constituents of solution to approximate those that have been recommended by the Bureau of Standards.

The throwing power of the solution can be increased by raising the chromic acid content to 55 ozs. per gallon. You will then be able to use a lower current density; also a lower temperature. At 105° F. a current density of 50 to 75 amperes per square foot should give best results.

We would not recommend a solution with the increased chromic acid content and the lower current density and temperature for depositing chromium when a hard, heavy deposit is required, such as for dies and tool work. We would rather use the Bureau of Standards recommendation.

—OLIVER J. SIZELOVE.

Copper on Aluminum

Q.—How can I plate copper on aluminum directly, without having to deposit nickel or zinc first? Please give complete details of cleaning solutions, copper plating solutions, etc., and method of operation.

A.—After the articles are polished, remove the heavy grease or buffing composition by washing in benzine or gasoline and dry in sawdust. Articles should then be racked or wired for plating and washed in an alkaline cleaner made of 4 oz. caustic soda to 1 gallon of water and used hot, until gas bubbles appear. Rinse in cold water and pass through an acid dip made of 2 parts nitric acid and 1 part sulphuric acid to remove any oxide that has been formed in the alkaline cleaner. Rinse thoroughly in clean, cold water and place directly in an acid copper solution made as follows:

Copper sulphate	28 ozs.
Sulphuric acid	(fluid) 5 ozs.
Water	1 gal.

When work is put in copper solution, strike it by using a high current density for a few seconds.

Reduce current density to 1 volt and 15 to 20 amperes per square foot and plate until desired thickness of deposit is obtained.

—OLIVER J. SIZELOVE.

Nickel Plating Information

Q.—I am sending you a sample of a nickel solution that has not been working properly and would like you to analyze it and give me your opinion as to its defects, if it has any.

I find that it plates dark. I tried it on a radiator shell, giving it 35 amperes. This did not work, so I cleaned the shell and plated again at 50 amperes. It still plated dark. Could this be due to low acid content in the solution? I made up the solution according to a formula you recently supplied and used it almost at once. After plating some small work from an automobile, I put in the shell, from the same car.

I have another idea. In trying to remove two iron bolts that had dropped to the bottom of the tank, I found the anodes contained iron in noticeable quantities. I was removing the bolts with a magnet and discovered that the anodes attracted the magnet strongly. Could this be the cause of the trouble?

What sort of strip can I use for removing nickel from brass and copper articles?

A.—Analysis of nickel solution:

Metallic nickel	3.06 ozs.
Chlorides	4.47 ozs.
pH	5.4

The constituents of the solution are fair with the exception of the pH. This is quite low. Add 3 ozs. of 26° ammonium hydroxide to each 100 gallons of solution.

Your trouble is not due to the condition of the solution, but elsewhere. Look to the anode and cathode current density that is being used.

The attraction of the magnet to the anode does not prove that the anode contains a large amount of iron. Nickel is magnetic and will also attract the magnet.

To remove nickel from a brass or copper base, use the following:

Water	1 gal.
Hydrochloric acid	8 ozs.

Use lead anodes. Operate at normal temperature with 6 volts.

—OLIVER J. SIZELOVE.

Zinc Barrel Plating

Q.—We are interested in the electro zinc plating of small articles that must be done by the barrel method. Please send us a list of books, circulars, or other sources to which we could look for information.

A.—There are two types of zinc solutions that are being used to electro zinc plate small articles by the barrel method. One is an acid solution, the other an alkaline one. Both have their merits, depending upon the class of work to be plated. The acid solution is somewhat less expensive, while the efficiency of the alkaline bath is greater.

Formula for acid zinc solution:

Zinc sulphate	40 oz.
Ammonia chloride	4 oz.
Sodium acetate	2 oz.
Water	1 gallon

If articles have deep recesses, add to solution 1 oz. of tin chloride for each 50 gallons of solution. An excess causes the deposit to stain easily.

Formula for cyanide solution:

Zinc cyanide	10 oz.
Sodium cyanide	8 oz.
Caustic soda	4 oz.
Water	1 gallon

For reference, we would recommend **Principles of Electrodeposition and Electroforming** by Blum and Hogaboom.

—OLIVER J. SIZELOVE.

Buffing and Polishing Data

Q.—Every so often a customer will write us for recommendations as to buffing and polishing different materials, and while we have a general knowledge as to what is necessary for some jobs, we also know that certain experimenting is necessary for different jobs in order to obtain the desired results.

We are much interested to know if you can give us a set of recommendations for buffing and polishing various materials. We want such data as size of wheels; surface speed of wheel for buffing; surface speed of wheel for polishing; kind of wheel and the grit or grade number of the various abrasives used.

At the present time one of our customers has asked that we furnish information on buffing stainless steel plates and pans.

A.—Your question is one which, to answer fully, would require quite some time, as practically each different metal requires special polishing and buffing operations; using a great number of different kinds of polishing wheels and many different kinds and classes of abrasives to produce the polished finish. Usually, the ferrous metals are first ground on emery wheels if the material is very rough, then roughed out with a canvas or similar wheel with No. 60 or No. 80 emery; fined with same type of wheel, using No. 120 emery; then grease buffed, using a felt or leather wheel with No. 150 or No. 180 emery; and finally finished with a tampico brush wheel, using emery paste or a felt or leather wheel which has been "set up" with flour emery.

The non-ferrous metals, being softer, usually require fewer polishing operations and the final finishes are produced on loose buff wheels, using a lime composition for the abrasive.

For the ferrous metals the sizes of wheels vary with class of work, running from 10 inches to 24 inches in diameter, with face surface from 1 to 4 inches. The same can be said for the non-ferrous metals. Usually, the surface speed of a polishing wheel is less than that of a buffing wheel, and both vary greatly depending upon the class of work being done.

Langbein's "Electrodeposition of Metals" contains several chapters on polishing. This book is for sale by THE METAL INDUSTRY.

—OLIVER J. SIZELOVE.

Durable Black Finish for Brass

Q.—Do you know of any method that can be employed in plating brass hardware to obtain a dull black finish that will withstand wear? At present we are using a black lacquer finish that wears off before the hardware leaves our factory.

A.—We believe that there is some trouble with the grade of black lacquer that you are using, or else the surface of the work is not clean when the lacquer is applied.

The most durable blue-black on brass is produced from the following solution:

Carbonate copper.....	1 lb.
Ammonium hydroxide, 26°.....	1 quart
Water	2 quarts

Add the water after the copper carbonate and ammonia have been thoroughly mixed. Use at a temperature of 175° F. There must be at all times an excess of carbonate of copper present or else best results will not be obtained from this dip. The surface of the metal is prepared the same as for plating and immersed in this dip.

—OLIVER J. SIZELOVE.

Plating on Ivory

Q.—I am trying to obtain a bright metallic finish on ivory. I wish to get a mirrorlike effect and I do not think that ordinary electroplating will produce this on ivory. Can you supply me with the information I need?

I have been told that there is a means of doing this by a new method which employs colloidal gold and silver and an electrolyte, but not as in electroplating. I also have heard of another solution, silver nitrate, in which the ivory is soaked and then removed and placed in an electrolyte for 6 seconds. It is supposed to have a metallic surface after that.

A.—If you wish to produce a highly polished metallic finish on bone or ivory, it will be necessary to metallize the surface by the use of a copper bronze powder mixed with a thin solution of cellulose lacquer and sprayed on the surface of the work to be plated. When dry, plate in acid copper solution until the deposit is thick enough to be polished bright, after which any desired finish may be produced.

We believe that the method you refer to is the one by P. Marino, as outlined by Samuel Wein, in the August, 1923, issue of THE METAL INDUSTRY.

—OLIVER J. SIZELOVE.

Method of Silvering Mirrors

Q.—Can you outline for me the procedure to follow in silvering mirrors? I would like to do this work and will appreciate complete directions.

A.—The usual method of silvering mirrors is as follows:

The surface of the glass must be chemically clean. Use gasoline to remove grease and then wash in mild alkaline cleaner. Rinse in clean cold water and then pass through a dip made of 1 part nitric acid, 3 parts water. Again rinse with clean cold water and flow over the surface of the glass the sensitizing solution which is prepared from distilled water 20 oz., tin chloride $\frac{1}{2}$ oz.

The work is now ready for the silvering operation, and two solutions are necessary for this purpose and made as follows:

No. 1 Solution

Dissolve 90 grams of granulated sugar in distilled water, add 4 c.c. of C.P. nitric acid and make to 1 liter with distilled water.

No. 2 Solution

Dissolve 1.8 grams of silver nitrate in 180 c.c. of distilled water and add ammonia drop by drop until the precipitate which forms is nearly redissolved, then add 0.9 gram of potassium hydroxide which has been dissolved in a little distilled water and again nearly redissolve the precipitate by the addition of a few drops of ammonia.

Take 1 part of No. 1 solution and 10 parts of No. 2 solution, mix thoroughly, and immediately flow over the surface of the glass that is to be silvered.

Apply as many coats of silver as is necessary, depending upon the thickness of the silver that is wanted, using a new mixture of the solutions each time.

—OLIVER J. SIZELOVE.

Peeling Nickel Plate

Q.—I recently nickel plated a radiator shell and found that about 6 sq. in. of the plate came off due to burning. I cleaned the bare place on the shell and put the whole thing back in the solution. The bare spot came out with a good plate on it, but the nickel on the rest of the shell

had all peeled off during the process. Can you tell me why this happened? I am sending you a sample of the solution.

A.—Analysis of the solution:

Metallic nickel	2.97 oz.
Chlorides	2.48 oz.
pH	5.8

The analysis indicates that your solution is correct and in very good condition. The deposit raised because of poor adhesion of the old nickel plate.

—OLIVER J. SIZELOVE.

Silver and Copper Solutions Analyzed

Q.—I am sending you samples of two solutions, copper and silver. The copper solution, which I took from BRASS WORLD, contains 3 oz. copper cyanide, 4 oz. sodium cyanide, 1 oz. soda ash. It is used cold. I use this for work to be silver plated; steel and brass articles. On white metal and Britannia it blisters.

I am sending the silver solution for analysis to find out if it is right. Sometimes the work blisters in the silver solution. I am not certain whether the copper or the silver is to blame. Please let me know what you think about these two solutions.

A.—Analysis of cyanide copper solution:

Metallic copper	2.01 oz.
Free cyanide	0.35 oz.
Carbonates	1.08 oz.

Add $\frac{1}{2}$ oz. of sodium cyanide and 1 oz. of carbonate soda to each gallon of solution.

To successfully silver plate white metal and Britannia metal, do not copper plate. Use a special silver strike made of sodium 8 oz., silver cyanide $\frac{1}{8}$ oz., water 1 gallon. After cleansing the work, use this strike preparatory to the regular silver strike.

Analysis of silver solution:

Metallic silver	2.87 oz.
Free cyanide	3.34 oz.
Carbonates	19.8 oz.

The metal and free cyanide contents are good but the carbonate content is exceptionally high. The best method of removing this is to lower the temperature of the bath to 28°F., when the carbonates will crystallize and become easy to remove.

Another method is to add barium cyanide to the solution, precipitating the carbonates as barium carbonate and filtering the solution. With this method the free cyanide of the bath increases.

—OLIVER J. SIZELOVE

Data on Copper and Nickel Plating

Q.—What is the best formula for hot copper solution for plating steel stampings?

If sodium perborate will stop nickel from pitting, what amount is it advisable to use and how is it dissolved?

Will sodium silicate cause pitting when introduced into a nickel solution?

A.—Formula for hot cyanide copper solution:

Copper cyanide	4 oz.
Sodium cyanide	5 $\frac{1}{2}$ oz.
Carbonate soda	2 oz.
Hyposulphite	1/64 oz.
Water	1 gal.

Temperature, 110° F.; anode current density, 6 to 8; cathode current density, 12 to 15; distance between anode and cathode, 5 to 6 inches. Use hot rolled anodes.

Sodium perborate, if added to a nickel solution to

stop pitting, must be neutralized, preferably with hydrochloric acid, before adding to the solution. The amount necessary to obtain results varies with the severity of the pitting. An excess causes no harm.

Sodium silicate when carried into a nickel bath due to improper rinsing methods will cause the nickel deposit to pit. Be sure that the alkaline film formed by the sodium silicate is thoroughly removed before nickel plating.

—OLIVER J. SIZELOVE

Chromium Solution Too Slow and Burns

Q.—I am operating the following chromium solution:

Chromic acid	1500 grams
Chromic sulphate	50 grams
Boracic acid	50 grams
Hydrogen peroxide	1 pint
Water	1 gallon

This solution works very slowly and also has a tendency to burn the work. I am sending a sample of the work and also of the solution.

A.—Your sample was lost in transit due to your use of a common cork instead of a rubber stopper. When the chromium solution ran out of the bottle it corroded the sample of the work so badly that it was impossible to learn anything from looking at it. The character of deposit was impossible to see. Send new samples if you wish to have your problem solved.

In the meantime, we can state that the following formula will give better results than the one you are using:

Chromic acid	55 oz.
Sulphuric acid..	0.3 oz. by weight
Water	1 gallon

Use 50 to 75 amperes per square foot of work surface, operate solution at 105°F.

—OLIVER J. SIZELOVE

Miniature Plating Plant

Q.—Can you give me information for setting up a small plating plant at home. I would like information on building and lining tanks and where to buy supplies.

A.—As you are contemplating the installation of a small plating plant at home for experimental work, we presume, we would suggest that you use small crocks to hold your cold solutions, as these are much cheaper than tanks and will answer the purpose just as well. For the warm solutions, procure enameled vessels. All plating supplies can be purchased through advertisers in BRASS WORLD.

We would also suggest that you purchase "Principles of Electroplating and Electroforming," by Blum and Hogaboom, which can be supplied by BRASS WORLD.

—OLIVER J. SIZELOVE

Brown on Brass

Q.—How can I produce a brown or statuary bronze color on sheet brass?

A.—To produce a brown color on brass, use the following formula:

Copper sulphate	4 ozs.
Nickel sulphate	2 ozs.
Potassium chlorate	1 oz.
Ferrous sulphate	$\frac{1}{4}$ oz.
Water	1 gal.
Temperature	180° F.

Work must be clean. The color depends upon the length of time the work is left in the solution.

—OLIVER J. SIZELOVE

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Volume Versus Profits

ONE of the life and death questions which confronts every operator of manufacturing plants, and particularly jobbing plants, is that of scaling prices with volume. Is it better to have a large volume of work at low prices than a small volume at higher figures?

After the enormous increase in plant capacity during the war, came the need for a large volume of business. When the post war slump fell upon us it was imperative that work be obtained to keep these tremendous plants busy. At once the words "overhead" and "idle capacity" assumed a meaning which they had never had before.

There were several ways of tackling this problem. The plants could be written off the books as a dead loss, which no one wanted to do, but some were forced to. They could be sold, which many tried to do and only some succeeded in accomplishing. Or they could be filled with work, providing the prices quoted were low enough to attract large orders.

With the combination of over-capacity and lowered demand, the market fell into the control of the buyer who took full advantage of it. He dangled the large order before his hungry suppliers saying, "Big business. You can have it if your price is right." Needless to say the price was seldom "right" unless it was too low for profitable operation. Executives demanded increased efficiency of operation at lower cost. Plant managers protested that this was impossible without large volume. How to get volume? Quote low prices. How low? No one could tell because estimating had degenerated into prayerful guesswork.

Conditions have improved somewhat since those days, but we still have with us the old dilemma. The owner of a job shop, plating or foundry, must decide for himself whether to go out for large competitive business at low prices or small special work at better rates.

There is no single answer covering all cases, except this—that never under any circumstances should work be taken below cost of labor, materials and overhead. It is perfectly reasonable to figure that in slack seasons or in bad times, an even break may be satisfactory, but it is unforgivable to take work below the cost of manufacture, whether through ignorance, carelessness or design. Circumstance will determine the margin of profit which may be demanded and obtained, but no circumstance at any time will ever justify taking work at a loss.

Questions and Answers

All inquiries are answered in the order received and, whenever possible, the answers published in the next regular issue

Brittle Nickel Deposit

Q.—I am sending you a sample of a nickel solution that has been giving me some trouble.

It is a still solution measuring 8 to 9 Baumé. It is heated to 70° F. in cold weather. I plate about 500 auto mirror backs made of brass each month. When the mirrors are inserted and the edges of the shells are bent over the bevelled glass, the nickel peels and cracks where the bend is made. I buff the brass to a high lustre and wash in an electro-cleaner, rinse in cold water and then nickel plate.

Perhaps the brass should be acid dipped before plating, to remove any oxide that may form in the cleaning? I have had no trouble plating steel.

A.—Sample of nickel solution sent analyzed as follows:

Nickel	2.94 ozs.
Chloride, as ammonium chloride..	1.63 ozs.
pH	4.8

The analysis shows your solution to be too acid and this factor produces a brittle deposit that raises when the edge of the article is turned over.

We would suggest that you add to the solution 2.5 cubic centimeters of ammonium hydroxide, 26° Baumé, per gallon of solution. Also, $\frac{1}{2}$ oz. of ammonium chloride to each gallon of solution.

After cleansing work in electric cleaner, rinse in clean cold water, pass through a weak muriatic acid pickle (3 parts water, 1 part muriatic acid), rinse in clean water and then nickel plate.

If you will follow these instructions we are sure you will have no further trouble.

—OLIVER J. SIZELOVE.

Chrome Tanned Leather Buffs

Q.—Can you give us a method by which we can remove the dope with which leather is filled so that glue and emery will stick for polishing?

We have a few wheels of the "Korry Krome" leather but it is filled with this dope and glue will not stick. We do not have many of these, hence it would not pay to go to any great expense to remove this.

A.—Korry Krome is chrome tanned leather and has the reputation of withstanding water and moisture absorption. It is so much more expensive than oak tanned leather that we are surprised that you use it for polishing wheels.

In chrome tanning this leather, the fibres are impregnated with the staining solution to make it moisture proof. Consequently we are not surprised that the glue and emery will not stick. If you roughen the leather with sandpaper and size the wheel before applying glue and emery, and then it will not stick, we cannot advise you other than to remove the leather from the wheels and use oak tanned leather.

—JOSEPH HAAS.

Chromium on Electrotypes

Q.—We have installed a chromium plant to chromium plate electrotypes. We are using the following formula:

Water (Dynamo).....	22 gallons
Chromic acid (1500 Amps).....	82 lbs.
Sodium sulphate (6 volts).....	8 oz.
Sulphuric acid.....	12 oz.

We find that it is impossible to chromium plate the center of an electrotype 10 x 10 inches in size.

Kindly give us any information you have that will help us.

A.—The formula that you have used contains a larger percentage of sulphate than is generally used and this causes the poor throwing power of the solution.

Add to the solution 1 pound of barium carbonate which has been dissolved in 2 quarts of warm water and if results are not satisfactory, send a 2 oz. or 3 oz. sample for analysis. Use a rubber or glass stopper on the bottle if you send a sample.

—OLIVER J. SIZELOVE.

Cleaning Galvanized Iron

Q.—Please tell me if there is any way to clean galvanized iron cross arm braces that have turned black from exposure to weather. I would like to clean them in some solution that will brighten them without removing the zinc coating.

A.—To clean up brightly black or darkened galvanized iron without removing the zinc is very difficult. You might try soaking them in a tri-sodium phosphate solution, boiling hot, made up with 2 ounces tri-sodium phosphate per gallon and then scratch-brush briskly wet.

However, we believe that you had better dissolve off the zinc by boiling in caustic potash solution, 4 ounces per gallon, and re-galvanize.

—JOSEPH HAAS.

Cleaning Strip Brass

Q.—We are wondering if you can tell us what is known as an acid dip. We have some slight acquaintance with acid dips used in combination with several rinses, including a hot whale oil soap rinse, in order to secure a bright finish on solid brass goods without buffing or coloring.

The thing we are anxious to find out now is whether or not there is any standard method of running solid brass strips, say $1\frac{1}{2}$ in. wide through such a dip in the coil form, unwinding the coil at one end and passing it through these various tanks with their several rinses so that it will wind up at the other end clean and shiny; with a view to stamping the articles out of it later on.

We might state for your information that the articles so stamped are not drawn, which, of course, would spoil the lustre.

A.—We believe if you would get in touch with a good equipment supply house, they would be able to construct such equipment as you mention.

On the other hand, would it be advisable to handle your goods in this manner? Would it not be far cheaper to stamp your items out and then dip them in bulk in baskets, rinsing very thoroughly and tumbling with sawdust in barrels?

—JOSEPH HAAS.

Copper Plating Solution

Q.—I would like to have some information on copper plating. I have tried out the following formula:

Copper carbonate	8 ozs.
Sodium cyanide	16 ozs.
Sodium carbonate	2 ozs.
Water	1 gal.
Current density.....	3 to 4 volts

This did not seem to plate at all. It was a dull color and after about 4 minutes in the bath the work would turn black and streaky. Worst of all, there would be a sediment settled on the bottom of the tank, like ice. From time to time I added copper and cyanide and soda but it all went to the bottom. In mixing I dissolved the ingredients in warm water. From the bottom of the tank I have skimmed over a bushel basket of stuff that looks like ice. On the surface a sort of foam forms. I have tried all kinds of current but this does not help either.

I am plating on steel and cannot get any sort of satisfactory results. Can you tell me what to do?

A.—Spill out the solution that you have made as it would cost more to attempt to fix it up than an entirely new one. Since you prefer copper carbonate to the copper cyanide salt, make up the following solution:

Copper carbonate	4 ozs.
Sodium cyanide	6 ozs.
Carbonate of soda	1 oz.
Water	1 gal.

Dissolve the carbonate of soda and sodium cyanide in three-fourths of a tankful of water. Then, in small batches, make a paste of your copper carbonate and, stirring well, pour into the tank. When all the copper has been added, fill up the tank to working volume. If the solution should be slightly greenish in color, which we do not believe will be the case, add $\frac{1}{4}$ ounce more of sodium cyanide for each gallon.

Since your old copper plate comes off so easily, you will save money by buffing or polishing off the deposit.

—JOSEPH HAAS.

Depositing Copper-Nickel

Q.—I am desirous of depositing a copper-nickel alloy in the approximate ratio of 70 nickel, 30 copper. If you can tell me how to do this, I will be very grateful.

A.—You cannot deposit an alloy of 70 per cent nickel and 30 per cent copper by the use of either the cyanide or acid baths. If the acid bath is used, no nickel will be deposited while with the cyanide bath the nickel can be deposited with copper, but it is doubtful if it could be done in the ratio of 70 to 30.

An alloy of copper and cadmium can be deposited from cyanide solution in any ratio, depending upon the proportions of the two metals in solution and the current density used. An alloy of 70 per cent cadmium and 30 per cent copper will be exceedingly white.

A little experimenting with copper and cadmium in the cyanide solution may give you the desired results.

—OLIVER J. SIZELOVE.

Green on Cast Iron

Q.—Will you please tell me how to put a green finish on copper plated cast iron or on cast iron in any finish, including plain.

A.—It would be useless to advise you to produce your green by the chemical method as the acids would eat through any copper plate and cause rusting of the base metal. The usual practical method to produce greens on steel is with colored lacquers. Therefore, we advise you to get in touch with advertisers of lacquers in BRASS WORLD and put your problem up to them.

—JOSEPH HAAS.

Pickling Sheet Metal

Q.—We are pickling scale off of sheet metal parts. Scale was caused by heat treating. After we pickle we neutralize in caustic soda solution, drying and dipping in oil. But after several hours rust begins to show up.

Can you advise the correct procedure for pickling and eliminating the rusting afterwards?

A.—If your sheet metal parts rust after pickling and drying, it is a sure indication that the acid from the pickling operation has not been thoroughly neutralized. For the neutralizing bath, we would suggest that you use 4 to 6 ounces of slaked lime to each gallon of water. Use boiling hot and let work remain in the solution for about $\frac{1}{2}$ hour.

Rinse thoroughly in clean hot water before oiling. Be sure that the oil is free from any acid.

—OLIVER J. SIZELOVE.

Increasing Chromium Throwing Power

Q.—For some time we have been working two chromium plating vats made up exactly to the formula given in Technologic Paper No. 346, published by the United States Bureau of Standards, Washington, D. C., i.e.: Chromic acid 33.5 ozs. and sulphuric acid 0.34 oz. per gallon.

We have obtained good work from the vats, the result (working at 90-110 amps. per sq. ft. cathode surface) being a bright, lustrous surface, after 10 minutes' plating, at 96° to 103° F.

The work to be chromium plated is previously well nicked in a hot agitated and automatically filtered solution made up from nickel sulphate, nickel chloride and boric acid.

The pH value of the nickel solution is approximately 6.3 (given by bromo-cresol indicator). The thickness of the nickel plate is .00075 in., approximately, and current density employed is 25 amps. per square foot of cathode surface. The work is then brightly mopped up.

Having given all our working conditions, the writer would be obliged if you could advise him about the following defect which we get on our chromium plated work.

We plate a large number of cycle handle bars and despite all reasonable precautions which we take we get very little chromium deposited under the lug which joins the stem to the bar. All round the lug (with the exception of the under side) the chromium is deposited well but the general appearance of the handle bar is spoiled by this patch of nickel still showing under the lug. It appears to be exactly like what is generally called in this country (England) a "blow," which occurs round a hole and results in no chromium being deposited round the hole.

We have an idea that if the throwing power of the solution could be improved we would get rid of the

trouble. We would appreciate any information you could give us on this point.

A.—There is nothing we know that would improve the throwing power of your chromium solution. The answer to your problem would lie in bringing an auxiliary conducting wire to the section that does not take the chromium deposit. Of course, this is based on the assumption that the section you mention is perfectly smooth and hard, with no small holes such as we have seen in many cycle handle bars that could be better polished (and would have to be better polished) to receive a chromium deposit at the lug which joins the stem to the bar.

—JOSEPH HAAS.

Pewter Finish

Q.—We have had several calls in our plant for a pewter finish on copper and brass and we should like to know how such a finish can be produced. We have tried silver plating the articles, oxidizing in a polysulphide solution then brushing most of the oxidize off. This leaves a dirty looking color, more brownish than pewter. If there is any practical way of getting this pewter finish, we would appreciate your advice on it.

A.—To produce a pewter finish, we would suggest that you use a deposit of antimony, as this will resemble a pewter finish very closely.

Such a deposit may be obtained by dissolving in a lead vessel 8 ozs. of antimony oxide in 15 ozs. of 48° hydrofluoric acid. Filter and make up to 1 gallon. The bath should be electrolyzed for a day or so; then add .03 oz. of aloin, or 2 or 3 drops of clove oil, to produce a smooth deposit. Use a cathode current density of 5 to 7 amperes per square foot.

For further information, see the May, 1917, issue of THE METAL INDUSTRY, pages 197 to 199.

—OLIVER J. SIZELOVE.

Plating on Non-Metallic Surfaces

Q.—Can you tell me how colloidal silver or gold, when in suspended condition in a solution, can be precipitated to a moist mass and the solution scoured off? How is an electrolyte used in changing a silver sulphide surface to pure metallic silver?

We have heard of certain work being done as follows: a surface to be gilded is soaked in a nitrate of silver solution. The silver soaks into the surface and then it is reduced to pure metallic silver by the use of ammonia nitrate or copper cyanide electrolyte. This is not the old electroplating method; it is some new process which I do not understand.

If you have any data on silvering, gilding or gold plating on non-metallic surfaces such as horn, bone or ivory, or know where I could get some of the latest and best data, please let me know.

A.—There are several different methods of preparing non-metallic surfaces for plating, but in general practice for the better grade of work the method is to precipitate finely divided metallic silver on the surface of the work to be plated.

The surface should be thoroughly cleaned with alcohol or benzine to remove any dirt or grease; rinsed in clean cold water; allowed to partly dry; and immersed in a saturated alcoholic solution of silver nitrate. Then let dry and repeat the immersion in alcoholic silver nitrate solution. When thoroughly dry after second immersion, subject the work to hydrogen sulphide gas to reduce the silver nitrate to silver sulphide, which forms a conducting surface for the copper deposit.

Another method consists of precipitating finely divided metallic silver from a solution of silver nitrate by placing a polished copper plate in the silver nitrate solution and agitating the copper plate. After this, you should dry the silver thoroughly and mix in bronzing liquid and spray the work.

For further information see Langbein's "Electro-Deposition of Metals," which can be purchased through BRASS WORLD.

—OLIVER J. SIZELOVE.

Repairing Plating Solutions

Q.—I am sending you samples of a nickel solution, a silver solution and a silver strike solution. These solutions have been giving trouble due to too much handling by persons not well versed in the business and probably need some revision. Please analyze these solutions and give me directions as to altering them to operate properly.

The nickel solution is 900 gallons, made up of double nickel salts and boric acid. I believe all it needs is proper replenishing.

The silver solution works sluggishly and produces a plate that is hard to scratchbrush. It can be operated only at a very low voltage. When the current is raised up to one volt or higher, it burns and the plate is dark and cannot be scratchbrushed. The anodes are very bright.

A.—Analysis of nickel solution:

Metallic nickel	2.34 oz.
Chloride, as ammonium chloride	1.70 oz.
pH	6.6

Analysis shows solution to be too alkaline. Add 60 fluid ounces of sulphuric acid to the 900 gallons of nickel solution.

Analysis of silver solution:

Metallic silver	1.89 oz.
Free cyanide	.79 oz.

The silver solution is low in free cyanide. Add 1½ ounce sodium cyanide to each gallon of solution and if work still plates dark and is hard to scratchbrush, get proper rheostat for a silver solution.

Analysis of silver strike:

Metallic silver	0.56 oz.
Free cyanide	0.96 oz.

Solution is very low in cyanide. Add 5 ozs. sodium cyanide to each gallon of solution.

—OLIVER J. SIZELOVE.

Solutions Analyzed

Q.—We are sending you sample of chromium plating solution which we would like you to analyze. We are also sending a sample of our cyanide copper solution which we are using cold.

We would appreciate your suggestions for improving these solutions.

A.—Analysis of chromium solution:

Chromic acid	54.6 oz.
Tri-valent chromium	0.9 oz.
Sulphates	0.57 oz.

Solution is too high in tri-valent chromium to obtain best results. Use the porous pot method to reduce the tri-valent content. Procure porous pot, fill with a chromic acid solution made of 2 pounds of chromic acid to one gallon of water, attach to cathode rod with insulated wire. Suspend a lead anode into the porous pot and connect to

cathode rod and work solution for quite some time with the highest current density that is possible. Do not add any more sulphate for some time to come as you have the sulphate content about the limit for best results.

Analysis of cyanide copper solution:

Metallic copper	4.08 oz.
Free cyanide	1.01 oz.
Carbonates	4.02 oz.

Solution is too low in free cyanide for operation at room temperature. Add 1 oz. of sodium cyanide to each gallon of solution and just enough hyposulphite of soda to clear the deposit. The efficiency of a cyanide copper solution can be increased considerable if operated at a temperature of 110° to 120° F.

—OLIVER J. SIZELOVE.

Silvering Mirrors

Q.—One of our readers is anxious to obtain formula for the silvering of mirrors for use in the mouth. Can you supply us with any data on the subject?

We would also be pleased to receive the titles of books on mirror silvering as well as on electroplating.

A.—The usual method of silvering mirrors is as follows:

The surface of the glass must be chemically clean. Use gasoline to remove grease and then wash in mild alkaline cleaner. Rinse in clean cold water and then pass through dip made of 1 part nitric acid, 3 parts water. Again rinse with clean cold water and flow over the

surface of the glass the sensitizing solution, which is prepared from distilled water 20 ozs., tin chloride ½ oz.

The work is now ready for the silvering operation and two solutions are necessary for this purpose and made as follows:

Solution No. 1

Dissolve 90 grams of granulated sugar in distilled water, add 4 c.c. of C. P. nitric acid and make to 1 liter with distilled water.

Solution No. 2

Dissolve 1.8 grams silver nitrate in 180 c.c. of distilled water and add ammonia drop by drop until the precipitate which forms is nearly redissolved, then add 0.9 gram potassium hydroxide which has been dissolved in a little distilled water and again nearly redissolve the precipitate by the addition of a few drops of ammonia.

Take 1 part of No. 1 solution and 10 parts of No. 2 solution, mix thoroughly, and immediately flow over the surface of the glass that is to be silvered.

Apply as many coats of silver as necessary, depending upon the thickness of the silver wanted, using a new mixture of the solutions each time.

After silvering, plate in acid copper solution and then in regular silver solution or nickel solution. The final deposit should be either nickel or silver, as neither deposit is injurious to health.

"Principles of Electroplating and Electroforming" by Blum and Hogaboom and Langbein's "Electrodeposition of Metal" are the two best works on the plating and finishing of metals.

—OLIVER J. SIZELOVE.

Associations and Societies

American Electroplaters' Society

HEADQUARTERS, CARE OF GEORGE GEHLING, 5001 EDMUND STREET, PHILADELPHIA, PA.

Rochester Branch

HEADQUARTERS CARE OF CHARLES GRIFFIN, 24 GARSON AVENUE
ROCHESTER, NEW YORK

Meeting at Buffalo

The Rochester Branch of the American Electroplaters' Society held a dinner at the Hotel Lafayette, Buffalo, N. Y., which was attended by members of the branch from Rochester, Buffalo and Niagara Falls. After the dinner, President Clarence Reama called the meeting to order to transact the month's business. In a brief talk the president stated the benefits of membership in the society, after which he turned the meeting over to S. P. Gartland, representing the Rochester members. Mr. Gartland outlined the work the Rochester men have done to bring the society up to present high place. He then introduced Frank Kolb, chief chemist of the Bausch and Lomb Optical Company, Rochester.

Mr. Kolb gave a fine talk in which he urged the platers of Buffalo to organize a branch there. A city the size of Buffalo, with all of its industrial development and many platers should have an active branch of its own, he declared.

L. R. Eastman, chemist of Frederic B. Stevens, Inc., Detroit, Mich., was the next speaker. His subject was polishing compositions, on which he gave a very interesting and instructive talk, from which many of the platers present gathered more information on compositions than

they had ever hoped to know. The address brought a vote of thanks from the audience.

—CHARLES GRIFFIN, Secretary.

Los Angeles Branch (Temporary)

HEADQUARTERS, CARE OF M. D. RYNKOF, 1354 WEST 25th STREET,
LOS ANGELES, CALIFORNIA

July Meeting

The temporary Los Angeles Branch of the American Electroplaters' Society held its regular meeting July 10, at the Central Y. M. C. A., Los Angeles. There were twenty-seven present, with Clarence E. Thornton presiding. As usual, the members ate dinner together before starting business.

After the routine business was disposed of, the officers for the new fiscal year were nominated. The meeting then was turned over to Librarian Charles Russell, who conducted an educational discussion. There were a number of questions on plating practice, most of which were answered by members and the balance will be answered at the next meeting after some of the members have had an opportunity to experiment and report results.

The Los Angeles Branch holds meetings the second Wednesday of each month, at 6:30 p. m., at the Central Y. M. C. A., Los Angeles. All platers are urged to attend and get the benefit of the social and educational features of membership in the Society.

—M. D. RYNKOF, Secretary.

Dallas Brass Expands Plant

Contracts for three new building units to cost approximately \$500,000 have been awarded by the Dallas Brass and Copper Company, Chicago, Ill., according to a recent announcement by C. D. Dallas, president. These additions will be made to the present rolling mills located on a 25-acre plot at 66th Street and Grand Avenue. A substantial addition to the brass mill and two new buildings will be erected for the carpenter shop and to house the engineering department and machine shop. These buildings will conform in design to the present plant and will be erected under the supervision of William F. Ehmann and Frederick Johnck, architects.

Chicago's growing demand for brass and copper is well reflected in the growth of the Dallas Brass and Copper Company which operates the only rolling mills located within the city limits. Founded in 1907, this company erected a three story plant at 820 Orleans Street in 1920. This building at first housed a battery of mills to produce brass and copper strips and sheets. In 1925 a holding of twelve acres was purchased at Grand Avenue and the

first units of the present extensive rolling mills were erected. Later, additional acreage was bought on which a modern casting shop and complete brass and copper mills are now located. The Orleans Street plant is now largely devoted to the general offices and departments which fabricate brass and copper products and lockseam tubing.

Comprehensive plans are now being made for the erection of additional units which eventually will occupy the entire 25 acres at Grand Avenue.

Specialty Manufacturing Company

Secretary Mitchell of the Specialty Manufacturing Company, 10698 Berea Road, Cleveland, Ohio, announces that in consequence of the steadily increasing demand for the firm's industrial and other brushes, it has been necessary to acquire a further extension of manufacturing space. The addition just completed will increase the space available for increased output to approximately twice the previous amount.

Personals

I. Edmund Waechter has been made general superintendent of the L. N. N. Foundry Company of Cleveland. He was formerly in charge of the Illinois Foundry Company, Springfield, Ill.

H. B. Hanley, has become associated with the American Laundry Machinery Company, Rochester, N. Y., as metallurgist in the foundry department. Mr. Hanley was formerly connected with Whitehead Brothers Company of New York.

George M. Schulthess has been elected president of the Garrett Brass and Aluminum Foundry Company, Garrett, Ind. Other officers of the company are Alfred J. Bahr, vice-president; D. B. Van Fleit,

secretary; C. H. Heinzerling, treasurer, and G. H. Tuck, general manager.

John Eckerle has sailed for Europe to make an inspection tour of the company's European distributors and to visit car manufacturing plants. Mr. Eckerle is president of Aluminum Industries, Inc., Cincinnati, Ohio.

George E. Irvin—Correction

The item in this section of our July issue, referring to George E. Irvin of Reading, Pa., incorrectly stated the firm with which he is identified as foreman plater. This firm should have been given as Penn Hardware Company, Reading, Pa., where Mr. Irvin continues in charge of electroplating.

Business Reports in Brief

Michigan Brass and Iron Works, Lansing, Mich., is planning to rebuild part of their foundry destroyed by fire July 28.

Fairies Manufacturing Company, Decatur, Ill., manufacturer of electric fixtures, is erecting a one-story addition, 80 x 240 ft.

New Jersey Art Foundry, 433 Tonnele Avenue, Jersey City, N. J., has plans for construction of a plant addition costing about \$30,000.

Seaman Foundry, 2307 Grand Avenue, Dallas, Texas, plans installation of additional equipment for manufacture of non-ferrous and iron castings.

Model Brass Foundry Company, 2309 Hickory Street, Dallas, Texas, has plans for extensions and improvements in its foundry, to cost over \$25,000.

H. D. Bronson Company, Beacon Falls, Conn., awarded contract for a two-story, 35 x 100 ft. brass goods manufacturing plant. Estimated cost \$45,000.

Bohn Aluminum and Brass Company, Detroit, Mich., awarded contract for a three-story, 110 x 145 ft. airplane parts factory. Estimated cost \$130,000.

Macval Pump and Engineering Company, Inc., New York, will manufacture on contract, 50 to 1500 gal. per min. bronze rotary pumps for fire and industrial purposes.

Kennedy Machine and Brass Company, Dallas, Texas, has added a non-ferrous and gray iron foundry building, 50 by 100 feet, and plans enlargement of gray iron foundry facilities.

Bassick Company, Austin Street, Bridgeport, Conn., manufacturer of casters, metal furniture trimmings, etc., is said to be planning a one-story addition, to cost about \$45,000 with equipment.

C. M. Gray Manufacturing Company, 358 Central Avenue, East Orange, N. J., manufacturer of die-castings, is considering plans for a three-story addition, to cost about \$70,000 with equipment.

Morgan Brass Foundry, Lincoln Avenue, Providence, R. I., destroyed by fire recently, has plans for a new plant. Hoisting equipment, furnaces and general brass foundry equipment will be needed.

Yale and Towne Manufacturing Company, Canal and Market Streets, Stamford, Conn., have approved plans for a one-story foundry addition. The new building and equipment will cost about \$60,000.

Charlotte Electric Supply Company, Charlotte, N. C., manufacturer of electrical specialties, has plans for a new one-story plant, to cost about \$24,000 with equipment.

The Bristol Company, Waterbury, Conn., has started work on a new one-story factory building at Waterbury plant, to be used by the hardening department.

Reliance Electric and Engineering Company, 1088 Ivanhoe Road, Cleveland, Ohio, has let contract for a one-story addition, 150 by 175 ft., to cost about \$115,000 with equipment.

Kunkel Manufacturing Company, Hart, Mich., manufacturer of automobile heaters, valve grinding tools, etc., is erecting a one-story addition, to cost about \$40,000 with equipment.

Girard Smelting and Refining Company, Tioga and Richmond Streets, Philadelphia, Pa., will soon ask bids on general contract for a one-story addition, to cost about \$140,000 with equipment.

Fladd-Luig Company, Inc., 213 Central Avenue, Rochester, N. Y., is a jobber of plumbing and heating supplies and is not going into manufacture of machinery, as erroneously stated elsewhere.

Midwest Stove and Enameling Company, 1100 South Charles Street, Belleville, Ill., has leased 5,000 sq. ft. of floor space from C. Heinz Stove Company, Second and Chestnut Streets, St. Louis, Mo.

Syracuse Ornamental Company, 581 South Clinton Street, Syracuse, N. Y., manufacturer of metal specialties, has awarded general contract for extensions, to cost about \$30,000 with equipment.

United American Metal Corporation, L. Muscat, president, 59 Paige Street, New York, plans construction of a two-story 125 x 125 ft. shop, at Scott Avenue and Randolph Street. Estimated cost \$40,000.

Charles F. Haller, Parsons, Kan., is at the head of a project to construct a new plant to manufacture aluminum products. Negotiations are under way with Chamber of Commerce, Fulton, Mo., for suitable site.

Belke Manufacturing Company, 2948 West Van Buren Street, Chicago, Ill., manufacturer of electroplating specialties, awarded contract for a one-story factory and office. **W. E. Belke** is head of the company.

Doehler Die Casting Company, New York City, has installed an electric heat treating furnace at its plant at Batavia, N. Y., for treatment of aluminum castings for airplane and outboard motors as well as other products.

Scovill Manufacturing Company, Waterbury, Conn., manufacturer of brass pipe, condenser tubing and kindred products, has let contract for a four-story addition, 21 by 165 ft., to cost more than \$65,000 with equipment.

Thomas Kelly and Brothers, 3424 West Lake Street, Chicago, Ill., manufacturers of plumbing equipment, brass goods, etc., have leased space in the building at 4442 West Roosevelt Road, 75 x 125 ft., for expansion.

Riter Brothers and Company, Inc., 1022 Race Street, Philadelphia, Pa., metals, has leased the former two-story and distributing plant of the General Electric Company at Frankford Avenue and Palmer Street, for expansion.

Mine and Smelter Supply Company, Salt Lake City, Utah, has purchased local property as site for a new three-story storage and distributing plant, with heavy hardware and machinery departments, to cost \$130,000 with equipment.

Pennsylvania Brass and Bronze Company, Inc., Philadelphia, Pa., has moved its offices to Twentieth

Street above Hunting Park Avenue. The company will continue to operate its brass foundry at Twenty-second and Master Streets.

Torrington Company, Torrington, Conn., manufacturer of metal specialties, swaging machinery, bicycle parts, etc., has organized a subsidiary to operate in Great Britain, under the name of Torrington Company, Ltd., capitalized at about \$25,000, and is said to be planning the establishment of plant facilities.

Daison Manufacturing Company, Inc., 462 North Eighth Street, Philadelphia, Pa., manufacturer of lighting equipment, lamp shades, etc., has purchased a four-story factory on site, 60 x 225 ft., at 2021 Naudain Street, for a new plant. Increased output will be developed.

Electric Household Utilities Corporation, Twenty-second and South Fifty-fourth Avenue, Chicago, Ill., has a new foundry under construction which is expected to be in operation by September first. The company formerly operated its foundry at Waukegan, Ill., in leased space.

Ha-Boy Metal Products Company, 1443 West Forsyth Street, Jacksonville, Fla., manufacturer of metal goods for automobiles, including all-metal ventilating shades, etc., is planning an expansion to more than double present capacity, to cost over \$40,000 with equipment. **William E. Boyett** is head.

Auto Specialties Manufacturing Company, Inc., St. Joseph, Mich., has purchased a 6-ton electric furnace from the **Pittsburgh Electric Furnace Corporation**, Pittsburgh. **Link-Belt Company**, Chicago, has installed complete sand-handling, continuous molding and sand conditioning equipment for the same company. The St. Joseph company has completed an addition to its malleable shop, providing for additional capacity.

Central Brass Foundry Company, Neenah, Wis., recently organized by **A. M. Schnetzer**, superintendent of **Neenah Brass Works**, for fifteen years, and **J. W. Hewitt**, one of the owners of **Hewitt Machine Company**, Neenah, will open a new foundry at Menasha, Wis., specializing largely in jobbing work on paper and sulphite mill machinery. Mr. Schnetzer has disposed of his interest in the Neenah Brass Works, and will be in active charge of the new company.

The Chromium Plating Corporation of Jackson Michigan, due to a large increase in production has enlarged its plant with an additional 5,000 square feet. The new laboratory installation is of the latest type for the analysis of customers' problems as well as the analysis of the company's, thus insuring uniformity of deposition and quality of plating. Due to additional orders being received, a new hard plating unit is being installed to take care of the demand for this class of work, the company states.

Midwest Carbide Corporation has recently been organized by **National Lead Company** and **Shawinigan Products Corporation**, New York, a subsidiary of the Shawinigan Water and Power Company of Canada, to carry on the manufacture of calcium carbide at Keokuk, Iowa, heretofore conducted by **United Lead Company**, subsidiary of the **National Lead Company**. Officers of the new company will be supplied from staffs of owning interests, **E. J. Cornish**, president, **National Lead Company** becoming president; **L. F. Loutrel**, vice-president of **Shawinigan Products Corporation**, vice-president and general manager of new company, and **T. F. Wettstein**, formerly of **United Lead Company**, vice-president.

New Companies

White Metals Architectural Products Corporation, New York, has been incorporated by J. W. T. Thompson.

Ideal Brass Foundry, Jamaica, N. Y., has been incorporated with \$20,000 capital by T. J. Towers, 90-50 Parsons Boulevard, Jamaica.

Die Casting Equipment and Engineering Company, New York, has been incorporated with 100 shares of common stock, by H. W. Stephen, 120 Broadway, New York.

Centri Cast Corporation, Cleveland, Ohio, has been incorporated with \$10,000 capital to manufacture and deal in metal products, by A. C. Lorman, Society for Savings Building, Cleveland.

Bro-Dun Metal Products Company, Lancaster, Pa., has been incorporated with \$25,000 capital, by Jerome S. Dunie, North West End Avenue and McKinley Avenue, Lancaster, to manufacture and sell castings and kindred metal products.

Garrett Brass and Aluminum Foundry Company, Garrett, Ind., has been incorporated to take over a business of the same name. The company will manufacture and deal in brass, aluminum and other metal castings.

Plastic Die and Molding Company, 249 Verona Avenue, Newark, N. J., has been organized to make stamping and forming dies and permanent molds by a new process. A. B. Strickler is secretary.

Service Station Equipment Company, 37 Parkman Street, Brighton, Mass., has been incorporated with

5000 shares of no par stock to manufacture and deal in pumps, gauges, castings, tanks, etc. L. P. Manning is president.

Smith Engineering Corporation, 429 Cambridge Street, Boston, 34, Mass., has been incorporated with \$10,000 capital to engage in business as toolmakers, brass founders, metalworkers, etc. Herman R. Smith is president. Company at present makes compressed air units and allied products and is interested in purchase of gauges, valves, fusible plugs, tanks, etc., all to be used for compressed air.

Piqua Electric Manufacturing Company, Piqua, Ohio, has been incorporated, and has engaged in the manufacture of electric fans, especially for exhaust and ventilating purposes. The company is contemplating building a new plant within the next year.

Moe Brothers Manufacturing Company, 113-121 E. Clybourn Street, Milwaukee, Wis., has been organized to manufacture lighting equipment and kindred products and is now in production.

Dur-O-Bilt Metal Corporation, 402-04 W. Twenty-fifth Street, New York, has been organized with capital of \$20,000 to manufacture metal equipment for restaurants, cafeterias and kitchens.

Bailey Products Corporation, Union City, N. J., has been organized to take over the business of Baily Manufacturing Company, local manufacturer of screw and metal products and of couplings for magnetos, generators and water pumps. O. G. Gist is president and G. A. Thomas, manager.

Trade Publications

Materials Are Important. Page Steel and Wire Company, Bridgeport, Conn. Welding wire leaflet.

High Speed Snagging. Norton Company, Worcester, Mass. Bulletins covering 16 inch and 24 inch swing frame machines.

Better Pickling Results. The Weaver Brothers Company, Adrian, Mich. Circular on temperature controls, pickling materials and pickle testing pills.

Suggestions from McPhilben Studios. McPhilben Studios, 153 Jamaica Avenue, Jamaica, N. Y. Illustrated catalog of colonial, early American and English design fixtures.

Duriron Centrifugal Pumps. The Duriron Company, Inc., Dayton, Ohio. Bulletins 151 and 152, covering pumps No. 102 and 403, respectively. Leaflets giving full engineering and descriptive data. These pumps are for acid handling, etc.

Plating, Polishing and Finishing Materials and Equipment. Lasalco, Inc., 2822-38 Lasalle Street, St. Louis, Mo. A complete, illustrated catalog of all supplies and equipment for electroplating, polishing, finishing, etc., of metals, issued in looseleaf binder. It contains 18 separate bulletins making 180 pages, including tables of technical data on equipment, with good illustrations showing the many devices offered. There is also a portion devoted to plating information, formulae, electrical data and other valuable material.

Trenton Manufacturers and Their Products. Trenton Chamber of Commerce, Trenton, N. J. Complete

list of manufacturers in one of the country's large cities, with notations of the products they make.

Brass, Bronze, Copper and Iron Novelties. The Cincinnati Artistic Wrought Iron Works Company, 2941 Eastern Avenue, Cincinnati, Ohio. Large illustrated catalog of this company's products.

The Largest and Most Powerful Ever Built. The National Machinery Company, Tiffin, Ohio. Forging machinery.

Houghton's Absorbed Oils. E. F. Houghton and Company, Philadelphia, Pa.

Gas Welding and Cutting Apparatus. Torchwelt Equipment Company, Chicago, Ill. Catalog No. 29, covering complete line of this company's products, in 40 pages, 8½ by 11 in.

Ladles. Whiting Corporation, Harvey, Ill. Catalog No. 210, giving full details and specifications of new ball bearing helical worm-gear ladles, standard worm-gear and pin spur-gear ladles, as well as many smaller types.

Heat-Treating and Carburizing Furnaces. W. S. Rockwell Company, 50 Church Street, New York City. Bulletin 295, covering enclosed front type annealing, hardening, normalizing, carburizing and drawing furnaces, electric or other heat.

Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa. Leaflet 20340-B, 300 and 400 ampere single operator welding sets; Leaflet 20416, drum controllers for general reversing service and for dynamic lowering hoist service.

Metal Prices, August 19, 1929

NEW METALS

Copper: Lake, 18.125. Electrolytic, 18.00. Casting, 17.375.
Zinc: Prime Western, 6.80. Brass Special, 6.85.
Tin: Straits, 46.875. Pig, 99%, 46.45.
Lead: 6.55. Aluminum, 24.30. Antimony, 8.875.

Nickel: Ingot, 35. Shot, 36. Elec. 35. Pellets, 40.
Quicksilver: flask, 75 lbs., \$125. Bismuth, \$1.70.
Cadmium, 95. Cobalt, 97%, \$2.60. Silver, oz., Troy, 52.625.
Gold: oz., Troy, \$20.67. Platinum, oz., Troy, \$62.50.

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	12¾ to 14
Brass Ingots, Red	15¾ to 16¾
Bronze Ingots	16¾ to 20
Casting Aluminum Alloys.....	21 to 24
Manganese Bronze Castings	27 to 39
Manganese Bronze Ingots	15 to 20
Manganese Bronze Forgings	35 to 43
Manganese Copper, 30%	30 to 40
Monel Metal Shot	28
Monel Metal Blocks	28
Parsons Manganese Bronze Ingots.....	16½ to 19¾
Phosphor Bronze	19 to 22
Phosphor Copper, guaranteed 15%	21 to 24
Phosphor Copper, guaranteed 10%	20 to 23
Phosphor Tin, no guarantee	55 to 70
Silicon Copper, 10%.....according to quantity.....	30 to 25

OLD METALS

Buying Prices		Selling Prices	
15¾ to 15¾	Heavy Cut Copper	16¾ to 16¾	
14½ to 14½	Copper Wire, Mixed	15½ to 15½	
13 to 13½	Light Copper	14 to 14½	
12 to 12½	Heavy Machine Composition.....	13 to 13½	
8¼ to 9	Heavy Brass	9¼ to 10	
7 to 7½	Light Brass	8 to 8½	
9½ to 10	No. 1 Rod Brass Turnings.....	10½ to 11	
11¼ to 11¼	No. 1 Composition Turnings.....	12¼ to 12¾	
5¾ to 5¾	Heavy Lead	6¾ to 6¾	
3¼ to 4¼	Zinc Scrap	4¼ to 5¼	
8 to 8½	Scrap Aluminum Turnings.....	9 to 9½	
11½ to 12	Scrap Aluminum, cast alloyed.....	16½ to 17	
17 to 18	Scrap Aluminum sheet (new).....	20 to 20½	
30 to 32	No. 1 Pewter	35 to 38	
20 to 21	Old Nickel Anodes	22 to 23	
20 to 23	Old Nickel	22 to 25	

Wrought Metals and Alloys

COPPER SHEET

Mill shipment (hot rolled)27¾ to 28¾c. net base
From Stock28¾ to 29¾c. net base

BARE COPPER WIRE

19¾c. to 19¾c. net base, in carload lots.

COPPER SEAMLESS TUBING

29¼c. to 30¼c. net base.

SOLDERING COPPERS

300 lbs. and over in one order26¼c. net base
100 lbs. to 200 lbs. in one order26¼c. net base

ZINC SHEET

Duty sheet, 2c. per lb. Cents per lb.
Carload lots, standard sizes and gauges, at mill,
less 7 per cent discount10.25 net base
Casks, jobbers' price10.50 net base
Open casks, jobbers' price11.00-11.50 net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base, ton lots, per lb. 33.30
Aluminum coils, 24 ga., base, price 31.00

ROLLED NICKEL SHEET AND ROD

Net Base Prices

Cold Drawn Rods..... 53c. Cold Rolled Sheet..... 60c.
Hot Rolled Rods..... 45c. Full Finished Sheet..... 52c.

BLOCK TIN SHEET

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge
or thicker, 100 lbs. or more 10½c. over Pig Tin; 50 to 100 lbs.,
15c. over; 25 to 50 lbs., 17c. over; less than 25 lbs., 25c. over.

SILVER SHEET

Rolled sterling silver 54.00c., Troy oz., upward according to
quantity.

BRASS MATERIAL—MILL SHIPMENTS

In effect April 16, 1929.

To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	\$0.23¼	\$0.25	\$0.26¼
Wire	.23¾	.25½	.26¾
Rod	.21¼	.25¾	.27
Brazed tubing	.30¾		.35¾
Open seam tubing	.31¼		.34¼
Angles and channels	.31¼		.34¼

BRASS SEAMLESS TUBING

28¼c. to 29¼c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod25¼c. net base
Muntz or Yellow Metal Sheathing (14"x48")... .24c. net base
Muntz or Yellow Rectangular sheet other
Sheathing25c. net base
Muntz or Yellow Metal Rod22¼c. net base
Above are for 100 lbs. or more in one order.

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Sheet Metal		Wire and Rod	
10% Quality.....	31¾c.	10% Quality.....	34½c.
15% Quality.....	33c.	15% Quality.....	37¾c.
18% Quality.....	34¼c.	18% Quality.....	41c.

MONEL METAL SHEET AND ROD

Hot Rolled Rods (base). 35 Full Finished Sheets (base) 42
Cold Drawn Rods (base) 40 Cold Rolled Sheets (base).. 50

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or
thicker, 500 lbs. or over, 8c. over N. Y. tin. price; 100 lbs. to
500 lbs., 10c. over; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 20c.
over; less than 25 lbs., 25c. over. Prices f. o. b. mill.

Supply Prices, August 19, 1929

ANODES

Copper: Cast	28c. per lb.	Nickel: 90-92%	45c. per lb.
Rolled, oval	27c. per lb.	95-97%	47c. per lb.
Rolled, sheets, trimmed	27¾c. per lb.	99%	49c. per lb.
Brass: Cast	27c. per lb.	Silver: Rolled silver anodes .999 fine are quoted from 55½c.	
Zinc: Cast	12½c. per lb.	Troy ounce upward, depending upon quantity.	

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 100 lbs.	100 to 200 lbs.	Over 200 lbs.
10-12-14 & 16"	1" to 3"	\$3.00/lb.	\$2.75/lb.	\$2.65/lb.
6-8 & over 16	1 to 3	3.10	2.85	2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 up to 6	¼ to 3	4.85	4.85	4.85
4 up to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

Grey Mexican Wheel deduct 10c per lb. from White Spanish prices

COTTON BUFFS

Full Disc Open buffs, per 100 sections.	
12" 20 ply 64/68 Unbleached.....	\$27.06to\$29.00
14" 20 ply 64/68 Unbleached.....	35.59to 37.65
12" 20 ply 80/92 Unbleached.....	30.70to 34.16
14" 20 ply 80/92 Unbleached.....	41.60to 46.09
12" 20 ply 84/92 Unbleached.....	36.00to 42.90
14" 20 ply 84/92 Unbleached.....	48.80to 57.60
12" 20 ply 80/84 Unbleached.....	38.35to 39.37
14" 20 ply 80/84 Unbleached.....	52.00to 53.12
Sewed Pieced Buffs, per lb., bleached.....	40c. to 73c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb. .14-19	Lacquer Solvents	gal. .85
Acid—Boric (Boracic) Crystals	lb. .08½	Lead Acetate (Sugar of Lead)	lb. .13¼
Chromic 100 and 400 lb. drums	lb. .19½-21	Yellow Oxide (Litharge)	lb. .12¾
Hydrochloric (Muriatic) Tech., 20°, Carboys.....	lb. .02	Mercury Bichloride (Corrosive Sublimate)	lb. \$1.58
Hydrochloric, C. P., 20 deg., carboys.....	lb. .06	Nickel—Carbonate, dry, bbls.....	lb. .35
Hydrofluoric, 30% bbls.	lb. .08	Chloride, bbls.	lb. .20
Nitric, 36 deg., carboys.....	lb. .06	Salts, single, 300 lb. bbls.	lb. .13
Nitric, 42 deg., carboys	lb. .07	Salts, double, 425 lb. bbls.	lb. .13
Sulphuric, 66 deg., carboys.....	lb. .02	Paraffin	lb. .05-.06
Alcohol—Butyl	lb. .16¾-.21¼	Phosphorus—Duty free, according to quantity..	lb. .35-.40
Denatured, drums	gal. .49-.59	Potash, Caustic Electrolytic 88-92% broken, drums	lb. .093
Alum—Lump, Barrels	lb. .03¾	Potassium Bichromate, casks (crystals).....	lb. .09¼
Powdered, Barrels	lb. .039	Carbonate, 96-98%	lb. .06¾-.07
Aluminum chloride solution in carboys.....	lb. .06½	Cyanide, 165 lb. cases, 94-96%.....	lb. .57½
Ammonium—Sulphate, tech., bbls.	lb. 3.3	Pumice, ground, bbls.	lb. .02½
Sulphocyanide	lb. .65	Quartz, powdered	ton \$30.00
Arsenic, white, kegs	lb. .05	Rosin, bbls.	lb. .04½
Asphaltum	lb. .35	Rouge, nickel, 100 lb. lots	lb. .25
Benzol, pure	gal. .60	Silver and Gold	lb. .65
Borax Crystals (Sodium Biborate), bbls.....	lb. .04½	Sal Ammoniac (Ammonium Chloride) in casks....	lb. .05½
Calcium Carbonate (Precipitated Chalk).....	lb. .04	Silver Chloride, dry, 100 oz. lots.....	oz. .42½
Carbon Bisulphide, Drums	lb. .06	Cyanide (fluctuating)	oz. .54-.56
Chrome Green, bbls.	lb. .25	Nitrate, 100 ounce lots	oz. .36½
Chromic Sulphate	lb. .30-.40	Soda Ash, 58%, bbls.	lb. .02½
Copper—Acetate (Verdigris)	lb. .23	Sodium—Cyanide, 96 to 98%, 100 lbs.	lb. .18
Carbonate, bbls.	lb. .21½	Hyposulphite, kegs	lb. .04
Cyanide (100 lb. kegs)	lb. .45	Nitrate, tech., bbls.	lb. .04¾
Sulphate, bbls.	lb. 6.7	Phosphate, tech., bbls.	lb. .03¾
Cream of Tartar Crystals (Potassium Bitartrate) ..	lb. .27	Silicate (Water Glass), bbls.	lb. .02
Crocus	lb. .15	Sulpho Cyanide	lb. .32½
Dextrin	lb. .05-.08	Sulphur (Brimstone), bbls.	lb. .02
Emery Flour	lb. .06	Tin Chloride, 100 lb. kegs	lb. .36½
Flint, powdered	ton \$30.00	Tripoli, Powdered	lb. .03
Fluor-spar (Calcic fluoride)	ton \$70.00	Wax—Bees, white, ref. bleached	lb. .60
Fusel Oil	gal. \$4.45	Yellow, No. 1	lb. .45
Gold chloride	oz. \$12.00-14.00	Whiting, Bolted	lb. .02½-.06
Gum—Sandarac	lb. .26	Zinc Carbonate, bbls.	lb. .11
Shellac	lb. .59-.61	Chloride, casks	lb. .06¾
Iron Sulphate (Copperas), bbl.	lb. .01½	Cyanide (100 lb. kegs).....	lb. .41
		Sulphate, bbls.	lb. .03½